DESIGN BASED ENTREPRENEURSHIP:

The transition from designer to entrepreneur

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Abstract

The inspiration for this research came from anecdotal evidence of the important relationships between design, entrepreneurship and innovation. In particular how designers could transfer their skills into the entrepreneurial settings.

In earlier studies, the connection between the designer's logic and the entrepreneur's logic have been established. In general, both profiles present a tendency to work experimentally, focusing on the effects of their actions rather than over-analysing the information available. In the early stages of product development and new venture creation, creativity represents a significant component of business success, yet, there is the need to change from striving for the ideal to realizing and implementing what is practicable. The implementation stage enticed the researcher to understand why there were very few testimonies of designers setting up consumer product companies. Anecdotal accounts available in the literature tend to tell 'the success story' of the journey without attempting to understand the underlying thinking patterns of the central characters. The researcher decided to come to Northumbria University, drawing upon its ranking of graduate business start-ups and the reputation and experience in both its Design and Business Schools.

This study explores the experiences and capabilities of *Designer Entrepreneurs* i.e. designers who have taken a founding role in a start-up organisation. It focuses on entrepreneurs bringing new consumer-products to market where they must manage the tensions between authoring the best possible new product, with the urgency and pragmatics of getting to market at the right moment.

The entrepreneurial process refers to the set of steps and decisions designers took to make their ideas reach the market. During this exploration, a significant finding on the entrepreneurial process emerged from the data: The intertwined influences of: *new product development* and *new venture creation* along with the *designer´s transition* (integrated by the designer´s mindset evolution and the sense of authorship). The sense of authorship contributes to the coherence between personal believes and desires and the final execution of the product/company. On the other hand, the designer´s mindset refers to the evolution of the mentality experienced by designers when move their expert area outwards. There are no studies concentrated on the transition experienced by designers when they set out on the entrepreneurial journey which is key to understand the entrepreneurial process. This study contributes a greater understanding of the

relationships and sometimes tensions between new product development, new venture creation and the designer´s transition during the entrepreneurial journey.

Also, this research synthetized a *Design Entrepreneurship for Consumer Product Innovation Typology* to help understand design entrepreneurship using a set of principles and tools taken from other theories from relevant Design and Business disciplines.

The study also describes the *entrepreneurial ecosystem* to prepare the ground for the research. The entrepreneurial ecosystem refers to companies, technologies, and platforms that interact with the entrepreneurs and have an impact on the product/start-up.

The study considered the testimony of more than 50 individuals, active within the design entrepreneurial ecosystem, including the Designer Entrepreneurs themselves. The research was carried out following a *constructivist grounded theory* approach, utilising a series of creative tasks and interview questions developed for this study. Each interaction with members of the ecosystem honed the researcher´s understanding of the research problem.

The key audiences for this research are design academics and designers at the outset of the entrepreneurial journey. From the academic side, academics can stimulate the entrepreneurial activity of design schools by understanding how successful Designer Entrepreneurs have taken a concept and convert it into a viable business. For the design and business incubators audience, this study helps to identify the benefits designers bring to the table, and how their intrinsic authorship, mentality, and practice-based approach facilitate the creation of meaningful products, as well as the start-up adaptation to uncertain environments.

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Preface

I began my career as a lean manufacturing engineer in MABE (one of the biggest home appliances companies in the world), in my hometown in Mexico. I learned how to improve the manufacturing processes and reduce the scrap and waste from the production line. However, my first encounter with design was through a colleague who majored in industrial design. Together we had to design tools to facilitate workers with their tasks and minimize the effort and potential injuries they might suffer during the task. Since then, I became more receptive to ergonomics, qualitative assessments and co-creation. After a couple of years, I enrolled in a master course in Innovation and Design, where I could see a more rounded version of design. This master helped me to see the potential impact of design in business and how it can help with the overarching company´s strategy.

After finishing my masters, I got an offer to run the master´s program. At the same time, I joined a high-tech business incubator as a consultant in Strategic Design and also started a part-time position as a lecturer-researcher at Universidad Autonoma de Queretaro, Mexico. For the following five years, I participated in research projects and delivered classes related to design, strategic design and design for innovation.

The idea of the PhD came about when I felt that my knowledge was not enough to solve my client's problems or my student´s questions. The topic of my PhD is thus an amalgamation of all the environments, projects and areas that I was involved in. I started this PhD journey to discover new methods, tools and techniques that can improve the success of consumer product start-ups and contributes to the design education.

Acknowledgements

I want to thank Professor Alison Pearce, for her invaluable support. She has been an incredible mentor in my academic career and also in shaping me as a better human being.

I want to thank my supervisors, Professor Matthew Lievesley, for his attention to detail and his thorough revisions of my work. His design acumen and experience shaped this research and expanded my knowledge on design and innovation. He has positively challenged all the assumptions I had about design and research, making this document more reliable and thorough.

To Professor Robert Young, for all his invaluable experience doing research and his perspective on design. He offered a wise advice that will have a longstanding effect on my professional career. To Sheng Feng Quin for his support at the beginning of this research.

This research would not have been possible without the support of Alejandra Castillo; her courageous spirit pushed me to take this leap, leave my comfort zone and learn from this experience. Her unconditional support helped me throughout this research.

I would like to dedicate my research to my family that allowed me to be responsible for my own decisions and cheered me up when I needed it the most and to my brother, who has been a role model in my life and academic career.

I appreciate all the support given by Irini Pitsaki, who encouraged me to collaborate with the master's program at Northumbria University and who helped me to become a better Lecturer.

I would extend my special thanks to Consejo Nacional de Ciencia y Tecnología in Mexico for its support throughout my studies and to the GETM3 project and the European Commission via the Marie Skłodowska-Curie program, which allowed me to stretch out my research to new horizons and gave me the opportunity to meet wonderful people in the UK and the rest of the world, some of them are like a second family to me.

My sincere gratitude to all my students who were always encouraging me to learn more, to share more, and to live more. I would not be here without you.

My sincere appreciation to my colleagues Shiro, Clair, Paul, Ollie, Nantia, Rob, Drumin, Sanne, Erika and Nukumbu for always acting as a supporting net and being critical about my work. This journey has been such a great experience thanks to them. Thank you to Michel Rusk for the talks we had at the beginning of my research.

Special thanks to my previous team at my Alma Mater in Queretaro, Mexico: Dr. Manuel Toledano, Dr. Juvenal Reséndiz, Dr. Aurelio Domínguez, Dr. Luis Bermúdez Cristancho, Dr. Carlos Soto Curiel, MDI. Héctor López Aguado. MD. Héctor Martínez Marín.

Thank you for sharing your knowledge and experience and to all my team at INCUBAUAQ, Mexico. I learnt so much from you guys.

Declaration

I declare that this work has not been submitted for any other award and it is all the result of my work. I acknowledge that this work contains opinions, ideas and contributions from others and does not incorporate, without acknowledgement, material derived from published or unpublished work from other individuals. An ethical clearance of the research has been granted on the 21st of August 2018.

I declare that the word count of this thesis is:
87,359.

Name: José Aldo Valencia Hernández

Signature:

Date: July 2020.

Abbreviations

List of abbreviations:

CGT: Constructivist Grounded Theory

GT: Grounded Theory

DECPI: Design Entrepreneurship for Consumer Product Innovation

DE: Designer Entrepreneur

SD: Strategic Design

CHAPTER 1 – INTRODUCTION

1.1 Introduction to the Study

Product market fit is one of the biggest problems that any company regardless of the size, has to tackle. Designers have the skillset and abilities to transform user´s research into articulable insights that create products relevant for users. This positions them in a crucial role within any organisation.

Organisations are increasingly operating in crowded markets, relying on innovation to respond to changing trends in consumption. This requirement for new product and service innovation creates opportunities for inventors, designers, and entrepreneurs across multiple sectors. Once, the first responders to these innovation opportunities were business entrepreneurs; now there is an increasing prevalence of designers as founders and co-founders of new start-ups – called the design entrepreneurs. However, there has not been an extensive study of this shift, specifically its alignment with literature and theory.

The literature available about the role of design to provide entrepreneurial leadership in a consumer product start-up is scarce. Few names like James Dyson, a UK design engineer who invented a very successful vacuum cleaner or Robert Law a UK product designer who invented a ride-on suitcase for children are some of the references for design entrepreneurship in consumer goods, yet there are no studies that expand on their mindset and logic.

Two main disciplines can contribute to shedding some light onto the topic: Design and Entrepreneurship (Business realm). Entrepreneurial studies point out that a poor fit, between the product offering and what customers really value, continues to be a primary factor in why start-ups fail. Design Thinking has the user's needs and how to deliver value to the customer in its core. These points trigger the idea of designers being capable of solving or of helping mitigate this problem due to the nature of their processes.

A creative world is arising. According to Bakhshi (2015), the creative workforce is likely to continue to grow, due to the resistance that creative occupations have towards the automation of labour; 87% of creative workers in the UK are at low or no risk of being displaced in this way.

In the last decade, companies such as Pinterest, Kickstarter and Airbnb have been recognised as high-profile tech-sector unicorns (start-ups with $1bn valuations), and all had designers in their core founding teams (Valencia et al., 2018). This depicts the capacity of Design

Approaches in entrepreneurship practice but raises questions: What can designers add to new postures of entrepreneurship? And what are the advantages and disadvantages of a design background in this area?

1.1.1 The ecosystem is ready for disruption

Another element of the current situation that is enabling the rise of designers as entrepreneurs is the reduction of cost in product development and manufacturing. The excessive investment required to bring new mass-produced products into the market has been decreasing in recent years. CAD, prototyping several iterations with multiple components and commissioning moulding tools are now more accessible than ever. This new situation has led to a dominance of established firms as the organisations large enough to manage the financial outlay and risks of such development. However, in less than a decade, technological breakthroughs have been shaping the face of new product development, allowing start-ups in the consumer product sector to gain speed and traction faster than ever before.

The democratisation of information, the dropping costs of technology, and the penetration of internet access and social media have created a global arena where unexpected entrepreneurs can emerge in any part of the world.

New trends in the way societies innovate are emerging. The maker movement (Hatch, 2014) enables more industrial design experimentation at a relatively low cost using open hardware technologies (such as Arduino and raspberry pi), 3D Printing, 3D CNC, laser cutting and microelectromechanical systems sensors.

According to Eleaver (2015), the following are significant trends that have changed how new product development occurs, making it faster, cheaper and more accessible to a broader population. The falling prices of prototyping increase the speed of iteration and proof of concept. Products like MakerBot, Cubify, and Ultimaker have a deep market-penetration among inventors, enabling them to test their ideas faster. There is also greater access to international suppliers through companies like Alibaba.com to source a wide range of components and commission part-manufacture at a relatively low cost. Additionally, funding mechanisms have changed. Crowdsourcing platforms are pushing forward the methods of financing and seed capital. Companies such as Indiegogo and Kickstarter can be used to serve two critical purposes in the development stage of a start-up. They are used to bring some funds to the company and also provide the validation needed for the product. Price setting, demographics and the possible size of

the market can be defined with the information provided by these sorts of platforms. Companies like Crowdcube go one step further, allowing regular people to invest in upcoming companies, bringing cash to the start-ups in exchange for equity.

Decentralised distribution channels break down the barriers and cost of traditional physical retail, allowing start-ups to showcase their products without any intermediaries or minimum orders. Companies like Amazon also handle the logistics behind the distribution of the products, making the structure of start-ups leaner.

International transaction platforms such as PayPal allow regular people to pay, send money, and accept payments all over the world. Start-ups are tapping into these platforms to hire offshore employees to help them out in specific technical tasks of research and development projects, dropping the cost of an in-house professional, and once again making the structure of the start-up leaner and speeding up the development process.

Makerspaces, hackerspaces and Fab-labs offer their users access to specialised machinery to speed up the process of prototyping, creating hubs as a by-product, where the creative class can meet up and share information and experiences (Forest, 2014).

In the case of the United Kingdom, as a result of these technological improvements, more business incubators, start-up programs and funds focused on new product development in consumer products are arising (The British Design Fund, The Design Council´s Spark programme and The Brunel Central Research Laboratory). These organisations provide expertise in business, intellectual property, manufacturing, technology and marketing to help entrepreneurs shape business opportunities in consumer end products. A wide array of new support functions has emerged for entrepreneurs. However, sustainable businesses don’t always result, and there is still a high attrition rate for new start-ups. Figure 1 summarises the companies and platforms mentioned above.

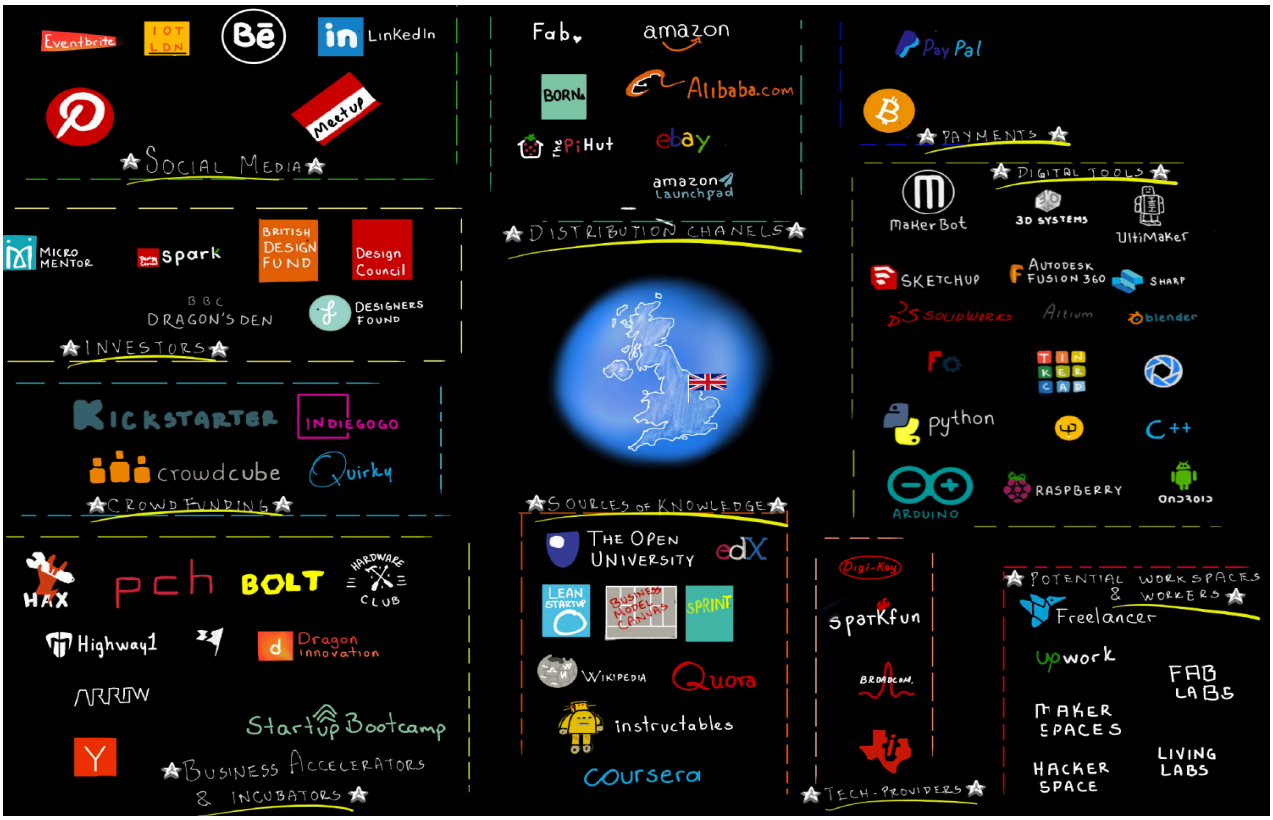


Figure 1. Sample of the product entrepreneurial ecosystem in the UK

1.1.2 The need for formal research

The best start-up environment requires a combination of technical skills, cognitive skills, and the right environment and culture to support their ideas, which makes universities, the right place to be (NESTA, 2007). Avant-garde universities are playing a key role on innovation, evolving from the traditionally missions of teaching and transferring knowledge. Nowadays these universities focus on stretching the research boundaries, giving people the skills to innovate, exchange knowledge not knowledge transfer, and "acting as a hub in an international network of knowledge" (NESTA, 2007). This transition still has a long way to go. From business to engineering schools, they prepare the students for a plausible-possible future, visualizing current trends and performing a combination of multi-trend scenarios to describe various alternative futures. Here, business planning is devoted to get a thorough competitive analysis, compiling market research, and financial evaluation to calculate risk-adjusted expected return (Dew et al. 2009). In the same way, at engineering schools, there is a formulaic approach to solve problems, trying to minimize failure, leaving no room to break down paradigms. Academia acknowledges

that future cannot be fully predicted, as there are always unexpected events that disrupt reality.

This is an uncertain type of future, the ambiguous one. Despite knowing this, universities in these areas kit up their students to face risk, not uncertainty. Mathematical models, historical data analysis, fixed formulas and wide tested principles are part of the subjects. But there is something that design schools are teaching to the world. Besides these types of issues, Design schools also prepare the students to learn from daily´s events, people, understanding the current social situations as well as making tangible their ideas to transform and modify future. They are the ones turning the possible future into a preferable type of future.

1.1.5 Design Entrepreneurship to attain innovation

Between industrial design and product innovation, there is a leap. This leap is when the team goes beyond the prototype and turns itself into a company that can bring the product to the market. The entrepreneurial activity covers the set of actions, mindsets and processes that enable the product to reach the market.

Designers of consumer end products need a practical way to start up a business. A way in which they get closer to a tangible solution faster, which is marketable and that the customers are willing to pay for. Instead, Bricolage and effectuation, do not concentrate on asking for detailed analysis; these logics focus on a set of principles aimed at always making progress. What is available determines the outcome, and the scarcity of the environment focuses the creativity.

Business schools have traditionally focused on analytical tools and methods to bridge the distance between an initial idea and getting to market. But analysis usually relies on understanding what has gone before. When a new path does not easily relate to previous experience, as in the case of innovation in new markets and technologies, there is no reliable trend to project.

1.2 Thesis summary

The following chapters reflect the learnings gathered by the principal researcher behind this study. It has been divided into eight chapters to take the reader through the research journey. A summary of the research philosophy and approach is presented below.

1.2.1 Philosophical Paradigm: Constructivism

1.2.2 Epistemology: Interpretivism

1.2.3 Ontology: Relativism

1.2.4 Methodology: Constructivist Grounded Theory

1.2.5 Research question: What is the designer's transition to become an entrepreneur in product-based start-ups?

1.2.6 Participants: participants fall into two groups. The first is the Entrepreneurs themselves including both Designer Entrepreneurs and Non-Designer Entrepreneurs, the second is the range of actors within the ecosystem, which supports entrepreneurs – including Investors, Business incubators/accelerators, crowdfunding and innovation platforms and academic commentators and experts.

1.2.7 Type of data: Qualitative

1.2.8 Type of data collection: Semi-structured interview, think aloud protocol, visual imagery, follow up conversations.

1.2.9 Method of Analysis: A priori code, theoretical sampling, open coding.

1.2.10 Stages of the research:

Stage 0 - Literature Review and Identification of the key discourse in both business and design schools

Stage 1 - Phase One Data collection: - Interviews with members of the product/start-up ecosystem; Phase Two Data Collection - Interviews with Entrepreneurs (facilitated using visual aids).

Stage 2 - Coding and Analysis

Stage 3 - Findings and discussion

Stage 4 - Contributions and conclusions

Stage 5 - Validity / Trustworthiness of the Study

1.3 Overview of the chapters of the thesis

The next paragraphs describe the overall content of the thesis. A description of each chapter is presented to facilitate the comprehension of the thesis to the reader.

Chapter 1

This chapter introduces the reader to the structure of the thesis and provides an overview of the study. The purpose of this chapter is to give a general view of the investigation.

Chapter 2: Literature Review

Chapter 2 is divided into two sections, the first one presents a review of the current studies around Design Entrepreneurship and the role of designers in start-ups. The second section focuses

on the relevant literature and lays out the foundations of the study. The literature review extends to areas such as the ecosystems where designers and entrepreneurs coexist with platforms, systems, services and tools to create their products and set up their companies. These chapters also provide the theoretical standpoint to define the theories of Design and Entrepreneurship taken in the study.

This chapter presents the most recent theories of entrepreneurship, including methods such as Design Sprints, Lean Start-up, Design Ventures, Casual Logic, Effectual Logic and Bricolage. In this initial chapter, the relevance of the impact made by Design in business is also discussed.

Chapter 3: Research Methodology

This chapter consist of three subsections: *research philosophy*, *research design* and the *development of the visual aids and the visual analytical tools*.

Research philosophy

The first subsection of Chapter 2 explains the research philosophy supporting this study. The research question and the philosophical assumptions are discussed in detail in this section. A brief review of the research philosophies provides the rationale of why the researcher chose the Constructivist Grounded Theory (CGT) as a research strategy for this study. The research approach is described and provides a clear explanation of what selected tools and techniques were used in this study. The different sampling techniques and data collection procedures available are described in this subsection.

At the beginning of the chapter, a full description of the CGT is provided. The second part of the section explains the way the data will be analysed and the different stages of coding that the study will require. Trustworthiness in Grounded Theory is introduced to explain the concepts of credibility, transferability, dependability and confirmability of the study. To conclude the chapter, the researcher presents the way in which theory will emerge from the study in CGT research.

Research Design

This subsection of Chapter 2 describes the study proposed to address the research question. The purpose of this subsection is to create a plan to collect consistent and significant information considering the resources available. This study follows the Constructivist Grounded Theory proposed by Charmaz (in Denzin & Lincoln, 2000), where she claims that CGT uses new insights, emergent questions and further information to construct not only the methodology, but also the analysis simultaneously. For Phase One, the objective is to develop emerging concepts of Design

Entrepreneurship from the members of the entrepreneurial ecosystem. For Phase Two, purposive sampling is utilized to select Designer Entrepreneurs who transit the entrepreneurial journey.

As part of the research design, this chapter describes a specific set of processes to ensure the trustworthiness in Grounded Theory. To maintain the sense of trustworthiness in the study, the researcher gathers evidence of internal validation, external validation, credibility and dependability.

Development of the Visual aids and analytical tools

This subsection of Chapter 2 covers the development of the visual aids for Phase One and Two. The visual aids developed for Phase One data collection was designed to explore the context and try to answer the questions left after the literature review stage. The researcher used these visual aids to run the enquiry with the entrepreneurial ecosystem. After collecting the data from Phase One, the second set of rapids were developed for Phase Two data collection. In parallel of the development of the Design Entrepreneurship for Consumer Product Innovation typology, the researcher documented the main ideas of the literature review in the form of imagery (mind maps, doodles, diagrams) that later on would be used as a prompt in the early stage interviews. The chapter covers the development and use of the multimedia visual aids, tools to analyse the information gathered, and the test of the preliminary DECPI typology.

In this subsection, the reader can find a justification of why the researcher utilized the visual methods as a way for enquiry in CGT. Katie Charmaz, one of the top leading academics in this field, advocates that grounded theorist can adapt the strategies depending on the difficulties of the studies. These sorts of methods have been used to generate data in the social sciences.

Visual thinking as a means of enquiry interviews relies on transcribed data to understand the narrative of the participant´s experience.

Chapter 4: Data collection: Phase One & two

This chapter comprises the two phases of the data collection. The first section describes the initial data collection from the entrepreneurial ecosystem of the study, referred to as **Phase One**. This study consists of two data collections phases. Due to the lack of empirical annotation about Design Entrepreneurship, for data collection Phase One, an explorative method was utilized to gather primary data. This model of enquiry evolved with each successive interview/encounter, to take advantage of the emerging insights. This flexibility in the investigative process opened new inquiries. Earlier viewpoints and also elements of the theoretical review in Chapter 2 of this study

reassured ideas gather during the literature review. The ecosystem data came from investors, business incubators & accelerators, platforms and events that design entrepreneurs use and visit and also from non-designer and Designer Entrepreneurs. A table of the themes that emerged from this section are also provided in this chapter. An extended list of insights can be seen in Annex D.

The second section of Chapter 3 describes the **Phase Two** of the data collection. This second round of interviews targeted specifically to Designer Entrepreneurs, provided interesting remarks in multiple directions, addressing topics such as technology, attitudes and behaviours, processes, mindsets, disciplinary values, management and personal transition.

The iterative approach followed in Phase One data collection favoured the construction of the interview model used in Phase Two data collection. In Phase One, investors, academics, platforms, incubators & accelerators, non-designer and Designer Entrepreneurs were interviewed to gain an understanding of the current situation of the ecosystem and grasp an overarching view of the issue. In Phase Two, the study narrowed down its scope concentrating on Designer Entrepreneurs and their transition, from being designers and becoming entrepreneurs.

The data obtained in the previous chapter suggested that there is a sense of authorship that drive designers towards building personal driven products, regardless of the market or if the technology has been proven before. To facilitate the comprehension of this phase, a visual chronology of the events has been produced.

Chapter 5: Findings & Discussions

This chapter presents the findings of the study and the respective discussion section.

Findings section

The first subsection of the study explains the findings of second phase data collection in a ***neutral voice***, describing the connections between the elements, themes, and categories; the following segment of this Chapter 4, the discussion section adds the ***researcher's interpretations*** and the comparison between the categories and triangulation with previous theories and recent studies in the Design Entrepreneurship field. The two main findings of the research are presented here, the *plasticity of the mindset* along with its own triggers, and the *sense of authorship* experienced by the Designer Entrepreneur.

Discussions section

This chapter discusses the concepts, relationships and interpretations of the findings. They are considered to previous studies from both design and business disciplines. The discussion concentrates on the concepts that the researcher considered relevant to this investigation.

This chapter discusses the evolving mindset of Designer Entrepreneurs as they progress in the business. This is built on their sense of authorship (reputation-making through stories); and how they build trust and authority as a new organisation in their field.

The researcher has chosen themes that emerged from the data due to their more significant impact on the research and design field. Theories from previous studies helped enrich the discussion.

Also, this chapter discusses the points added to and subtracted from the preliminary DECPI typology. The mindsets and the authorship exposed as one of the principal findings of the previous chapter are enriched with existing theories and discussed in this section.

Chapter 6: Design Entrepreneurship Theory

As suggested by Charmaz (2004) and Guba & Lincoln (1989), the theory disclosed in this chapter has been deployed concisely. The research approach of this study produced a theory that explains why, how, and what is the transition experienced by the designer when they become entrepreneurs. The insight gained from participants in this study shaped the understanding of how this process works and is experienced by them.

The theoretical model of the transition of the mindset that typifies a designer's experiences when they transition from being principally designers to being primarily entrepreneurs is vastly explained in chapter 7.

Chapter 7: Contributions and Conclusions

This chapter presents the contributions attained by this research, summarizing the main findings and providing the reader with a description of them.

Multiple methods and models explain how entrepreneurs take an idea and transform it into a tangible product and/or to create a new venture. Nevertheless, none of these methods or models describes how a designer transforms himself into an entrepreneur. This research does not claim to have found the way to do so, yet, it proposes that the mindset is one key element to work with to help designers find their way through setting a product-based company.

The study developed the DECPI typology to explain the Design Entrepreneurship phenomena. This first approach covered the development of product and start-up, however, after the first interaction with the stakeholders in the entrepreneurial ecosystem, it was clear for the researcher that on the personal level some changes had a critical impact on both product and start-up. It would be delusional to claim that this study has kept track of all the changes experienced by Designer Entrepreneurs, yet, among all them, the data in this study have shown evidence of four critical changes in their mindset: The Artisan, the Configurator, the Opportunity Seeker and the Design-leader mindsets.

Chapter 8: Trustworthiness of the study and the experts´ validation

This study has collected and analysed the experiences of a cross-section of stakeholders, first within the consumer product development ecosystem and subsequently from Designer Entrepreneurs. This chapter is divided into the trustworthiness and the expert´s validation sections. The first section discusses the way the collected data has been analysed and interpreted by the researcher to achieve findings that can be trusted. In qualitative research studies, the model of trust criteria is often met with concern in terms of credibility, transferability, confirmability and dependability, of the whole study. In this section, the actions taken to attain the credibility in the study are described. Similarly, this section describes the attempt to generalize the study findings. However, as it is explained in the limitation section (Chapter 7.5), the findings of the study are limited to product designer entrepreneurs in consumer product start-ups, since there is no gathered evidence from other types of designers (graphic, service and user experience designers).
The confirmability of the study is detailed at the end of the chapter.

Chapter 8.3 addresses the opinion from experts about the research and its findings. This research is based on the experiences of individuals who play an active role in new product innovation and new venture creation. The specific interest of this study is the transition that designers experienced when they commence their entrepreneurial journey. Chapter 4 contrasted the findings with existing theories from the management and design fields. However, the findings of this study required a critique from people who are currently at the frontier of practice and knowledge in Design and Entrepreneurship. This section of Chapter 7 presents the opinion and commentary of expert Designer Entrepreneurs and professional experts on new product development and new business creation.

CHAPTER 2 - LITERATURE REVIEW

2.1 Introduction to this chapter

This chapter introduces the literature on current theories of design and entrepreneurship and the association between these two issues. This research is focused on consumer product start-ups, specifically where new tangible products are being created.

This chapter addresses the available theories that can explain the Design Entrepreneurship. There is little academic literature on this topic. Still, it is getting recognition in the academic domain that design should be well-positioned to help business start-ups circumnavigate such pitfalls.

To summarise the predominant theories of design and the recent theories of entrepreneurship, this chapter concludes by presenting a preliminary typology of these two theories. The benefit of the typology is that it characterises the Design Approach, finding both parallels and distinctiveness concerning other models of entrepreneurship. This typology supports the following chapters providing a bedrock where the researcher can build a deeper understanding of the issue. As such, it has the potential to assist the correlation of theory and practice, leading to an improved understanding of the paths to successful entrepreneurship (Valencia et al., 2018).

2.2 The design approach

The modern practice of design has evolved from an object-centred process to a multidisciplinary act that understands the human actions systematically, and lately to a cross-disciplinary approach that engages deeply with the human (Archer, 1981; Cross, 1999, Max-Neef, 2004).

Currently, design practices are far away from linear methodologies. The complexity of the current phenomena requires a holistic approach. According to Davis (2008), the design process has different methods: one from the engineering view and the other from a psychological perspective. There are some similarities between the two concepts and several opportunity areas. Howard et al. (2008) compared the design process throughout history. In several cases of the engineering design process, the “establishing a need phase” is hardly taken into consideration. This gap allows reinforcing this phase to help align the team goals, create empathy with the analysed subject, and build rapport inside and outside of the team. The knowledge provided by these stages feeds the following steps of the design process (Valencia, 2012).

Design is seen as a method aiming to create new approaches, unique ideas and also helps to incubate business ideas (Acklin & Wanner, 2017). Designers contribute to configuring solutions

using their methods and tools. By building the minimum viable product, a business hypothesis can be tested to gather feedback about the potential users, since the market and integrate and transmit the vision of the product among the stakeholders. But there is more that Design can contribute. According to Dell'Era and Verganti (2018), Design thinking (DT), can assume different forms. Design thinking enables creative problem solving, contributing to face wicked problems; It sprint execution by delivering and testing products, that latter will help gather information from the customers to improve the proposed solution. Design thinking is also a way to gain creative confidence, enabling people to make them more confident with creative processes. Lastly, Design Thinking can envision new propositions of meaningful experiences to people, by innovating the meaning of things.

Valkenburg et all (2016) asked practitioners how they use Design Thinking in their innovation practice, and they came up with, as they describe them, four images of Design Thinking:

- Value-driven innovation: DT helps to reframe the business mode aiming to get a sustainable value proposition.
- Experience-driven innovation: DT is responsible for the creation of experiences, this requires to involve people in the process as a co-creators and co-users.
- Purpose-driven innovation: DT is used to integrate all of the knowledge bases, views and interests of different disciplines to serve a single purpose.
- Vision-driven innovation: DT creates strategic proposition for innovative directions, exploring future possibilities, and sustainable business ideas.

On the same line, Design seeing from the managerial perspective relates to the procurement of resources, the talent and agenda to fulfil the established goals of a company. For Joziasse (2011b), "Design management needs design leadership in order to know where to go and design leadership needs design management to know how to get there".

2.3 Design characterization

Design as discipline has multiple facets. Design seeing from the managerial perspective relates to the procurement of resources, the talent and plan to fulfil the established goals of a company. For Joziasse (2011b), "Design management needs design leadership to know where to go, and design leadership needs design management to know how to get there".

2.3.1 Strategic Design

Strategic design uses the principles, tools and methods from the design discipline to influence strategic decision-making within an organization (Calabretta, 2017). It provides a way to use design to build essential business objectives (Lockwood and Walton, 2008) such as:

2.3.1.1 Purchase influence/emotion:

Design provides guidance in the configuration of the products to boost emotions and lure the customers´ purchase.

2.3.1.2 Build brand image and corporate reputation:

Design supports the company to show its capabilities to all the stakeholders. The configuration of the solution and the company´s touchpoints determine how the customer and the stakeholders perceive the brand.

2.3.1.3 Enable strategy/enter new markets:

Design helps visualize the business strategy and engages stakeholders by sharing the same vision, to enter new markets, design the focus of the product, its communication, interfaces and experiences, to let users understand its purpose.

2.3.1.4 Increase customer satisfaction, and develop communities of customers:

The inclusive process of design involves customers from a very early stage by asking for their feedback. This interaction guides the designer to a more effective solution.

2.3.2 Design Thinking

For Brown (2004), Design Thinking can be explained as "an analytic and creative process that engages a person in opportunities to experiment, create and prototype models, gather feedback, and redesign using visual, empathetic and experimental tools". It concentrates on designing effective solutions and solving complex problems to meet social needs and (Rotherham & Willingham, 2009) an empathic understanding of the problem to solve it (Dam & Siang, 2017). According to Owen (2016) Design Thinking is based on the following principles:

2.3.2.1 Visual language:

Utilizing a wide range of tools, designers can communicate concepts, ideas, stories and how they are connected to the big picture.

2.3.2.2 Bias for adaptivity

The flexible mind-set of designers allowing them to be open to accepting new ideas.

2.3.2.3 Systemic Vision:

A holistic understanding is needed to tackle more complex problems.

2.3.2.4 Qualitative mind-set:

People´s insights are gathered through qualitative methods, concentrating on the profundity of the information.

2.3.2.5 Cultural fitness:

The ethnographic research tools of design draw the connection between the subject, the objects and its context. Cultural fitness is achieved by considering the characteristics of the solution and how they interact between people and its context.

2.3.2.6 Aesthetic acumen:

Designers have skills and processes that enhance the aesthetic experience, through paying attention to details and deem trends and social changes.

2.3.2.7 Human-Centred focus:

The process of design begins with the people being designed for and ends with solutions tailored to meet their needs (Design Council, 2015).

Currently, design practices are far from linear methodologies. The complexity of the current social phenomena requires a holistic approach. Howard et al. (2008) compared the industrial design processes throughout the last 50 years. He identified six different phases among all of them, shown in figure 2.

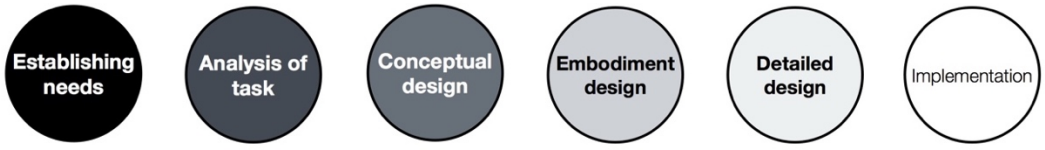


Figure 2. Six general phases identified by Howard et al (2008) summarizing 50 years of industrial design process.

It should be noted that these steps are embedded within a corporate system, where the designer is integrated to a more significant chain of actions. A recent view of the design process involves interaction with multiple disciplines. We can see that design is an innovation process that can leverage the performance of entire organizations (Kumar, 2009).

2.4 The entrepreneurial perspective

Several influential entrepreneurship models are derived from practice which are pertinent to product development and venture creation. Based on his experience of working with Silicon Valley start-ups, Eric Ries (2011) outlined the Lean Start-up method, aiming to shorten the cycle of product development through experimentation and iterative processes. Knapp (2016) used Design Thinking (Brown, 2008) to cut short the operation of four steps of the Lean Start-up method that composed of the idea, build, launch, and learn into just two stages: Idea and learn. He came up with Design sprints to reduce the time cycle and risk when bringing new products to the market. Along the same lines, using its gained experience working with companies as a design agency around the world, Frog Design (USA) developed Venture Design (2016). This aims to shape the whole business opportunity through design-methods; it favours progress over perfection and facilitates interdisciplinary working. Serial technology entrepreneur Steve Blank detailed a method based on a scientific approach to entrepreneurship, whereby repeated testing and accurate measurements can increase the success rate of start-ups (Steve Blank, 2012).

However, no theory addresses Design Entrepreneurship specifically. A study run by Moller that focuses on how designer entrepreneurs run their companies discovered that designer entrepreneurs lack business competencies in marketing, administration and operation (2013). However, there is an opportunity to study the tools used in design-driven start-up working on New Product Development (NPD) as well as the ecosystem needed to succeed in the market. New studies show the overlap between the designers' ways of "knowing and doing" as proposed by Cross some years ago and the expert entrepreneurial logic (effectuation) proposed by Sarasvathy (Moller, 2013). The competencies in identifying user needs, generation of ideas, and the conceptualisation of a new product are usually used as a basis for spotting designers as innate entrepreneurs (Gunes, 2012).

Different studies presented by Koh, (1996) and Vesalainen et al., (1999) showed how individuals in creative domains are more likely to become "free lancers" (also known as self-employed).

2.4.1.1 Causation, Effectuation and Bricolage

In this study, Causation, Effectuation and Bricolage, the three theoretical perspectives previously mentioned were taken into consideration for the broad understanding of the problem, including their logic, principles and mind-sets, allowing for future descriptive analysis of the

Design Entrepreneurship approach. The practical approaches such as *Lean Startup*, and *Design Sprints* were excluded from this analysis since their prescriptive nature of the approaches, focused on steps and tools. Design Ventures has been ruled out due to the limited information available about it.

Among these new approaches to entrepreneurship, Bricolage and Effectuation share a principle where the means dictate the end goals. Both are flexible when it comes to the future of the start-up. The creative and experimental mindset are fundamental to come up with different combinations. Both Bricolage and Effectuation discover the problem as they are building the solution, drawing a similarity with design-based approaches. Cross (2001) described this as; *designerly ways of knowing*, where design defines the problem as it is unveiling the solution. Sarasvathy (2008) could identify a logic or reasoning of the expert entrepreneur, called Effectual Reasoning (ER). They use this reasoning as a basis for their decision-making in the setting up a company. Moller (2013), identified an overlap between effectual thinking and the expert designer´s reasoning, on shared assumptions, principles and process.

Figure 3 shows the comparison of the traditional new venture creation logic with one of the "emerging theoretical perspectives" (Fisher, 2012) called effectual logic as suggested by Sarasvathy (2008).

Figure 3. Causal model vs Effectual model of new venture creation (Sarasvathy, 2008).

Expert entrepreneurs, the ones that have attained reliable, superior performance at their start-up business, argue against taking predictions seriously, they instead work with things they

can control, even if that means changing their initial goals and visions for the future (Dew et al. 2009). Expert entrepreneurs also look forward to reducing the cost of failure by enabling the failure to occur earlier and at lower levels of investments. They believe in a *Yet-to-be-made* future (Gabrielsson, 2009). Entrepreneurs tend to find ways to reach the market with the minimum expenditure of resources in terms of time, effort and money (Sarasvathy, 2008).

2.4.1 Causal logic

Causal Logic is based mostly on economic thinking to describe the entrepreneurial action (Fisher, 2012). The use of prior knowledge and prediction minimize risk (Sarasvathy, 2005).

As part of the principles in this approach we find:

- Pre-set goals: it assembles the means after a goal is set.
- Expected return: it first targets a return, then works to minimize associated risk.
- Avoid contingencies: it works to minimize the probability of unexpected outcomes.
- Inevitable future mind-set: it accepts that established market forces will cause the future to unfold.
- Statistical analysis: Based on related previous quantitative evidences, prediction and forecasting vv takes control of the analysis.
- Competitive Analysis: it presumes that competitors are rivals to contend with.

2.4.2 Effectuation

On the other hand, Sarasvathy (2008) identified Effectual Logic when she conducted a study with expert entrepreneurs, finding that they make decisions based on what they have at hand. They see challenges as opportunities, they rely on their personal network, the end goal is not fixed and by focusing on the downside of the venture, they first consider what they are willing to lose rather than the possible gains. Sarasvathy (2008) summarises these principles as follows:

2.4.2.1 Start with your given means

Who am I? What do I know? and Who do I know? are questions that the entrepreneur uses to imagine possibilities that come from their given means.

2.4.2.2 Focus on the downside risk:

Experienced entrepreneurs also consider what they can lose, instead of simply looking for a large profit or all-or-nothing opportunities. The *affordable loss* principle refers to the simple question: What can I afford to lose if I do this? (Sarasvathy, 2006).

2.4.2.3 Leverage contingencies:

The worst-case scenarios are preferred over the "what if?" scenarios by experienced entrepreneurs. They utilize bad news as a potential clue to explore not anticipated markets.

2.4.2.4 Form partnerships:

Experts reduce uncertainty and co-create the new market with its interested participants.

2.4.2.5 Control over prediction:

Expert entrepreneurs focus on the activities they can control since they are looking for desired outcomes. They believe the future is made, therefore it is not predicted or found.

2.4.2.6 Co-creation of the opportunity:

The self-selected stakeholders and the *entrepreneur* act together towards the same goal.

2.4.2.7 Failure as a learning experience

Failure is seen as a source of knowledge rather than as a failure

2.4.3 Bricolage

Besides this theory, Baker and Nelson (2005) discovered that some entrepreneurs started their businesses by utilising the available resources in new ways, improvising on the go to solve new problems and create new opportunities, this theory was called Bricolage (BR). According to Levi Straus (1967) Bricolage has got a tendency towards a hands-on mentality, which engage the individual actively with the problems rather than analysing and predicting possible outcomes from what is at hand. The principles under this logic are (Baker and Nelson, 2005):2.4.3.1 Combinational process:

Looking for new combinations of available means for different applications than those for which they were originally intended or used.

2.4.3.2 Scarcity:

Lack of resources (time, funding and knowledge) focalizes creativity.

2.4.3.3 Making do:

Find results with a hands-on attitude using the limited skills and resources in creative ways.

2.4.4 Two ways of tackling the same problem: New venture creation

Expert entrepreneurs, the ones that have attained reliable, superior performance starting-up business, argue against using forecasts actively, they instead work with variables they can control, even if that meant drifting from the initial goals (Dew et al. 2009). They proceed in an effectual framework expecting new effects and unanticipated ends with their given means (Niesen, 2013). Figure 4 shows the Casual and Effectual models contrasted.

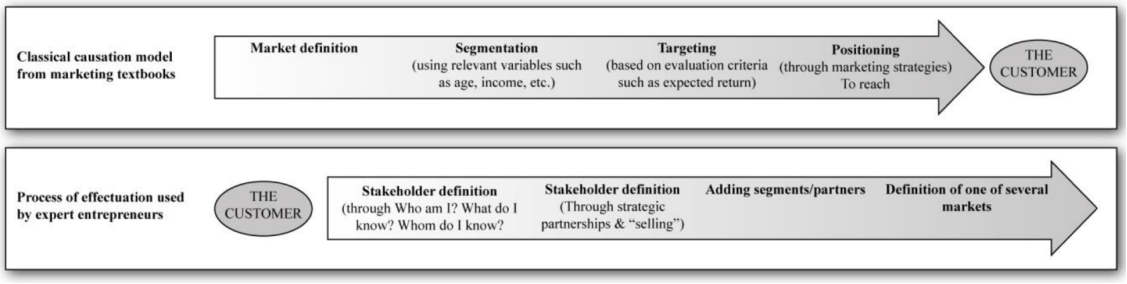


Figure 4. Casual and Effectual models contrasted. Taken from Nielsen, Wikström, & Tollestrup (2013) and modified from Sarasvathy, (2008).

New venture creation has two external variables to take into consideration. These are the market and the product. In the next matrix, we can see how a new product in a new market increases the uncertainty since there is insufficient previous data or it is unknowable. Whereas, starting a venture with a traditional product in a conventional market, risk can be calculated, since there is available data from the past. Figure 5 shows the matrix created by Sarasvathy to explain Risk/Uncertainty relation between markets and products.

Effectual logic is useful when the product and the market are new; this means that traditional marketing techniques are useless.

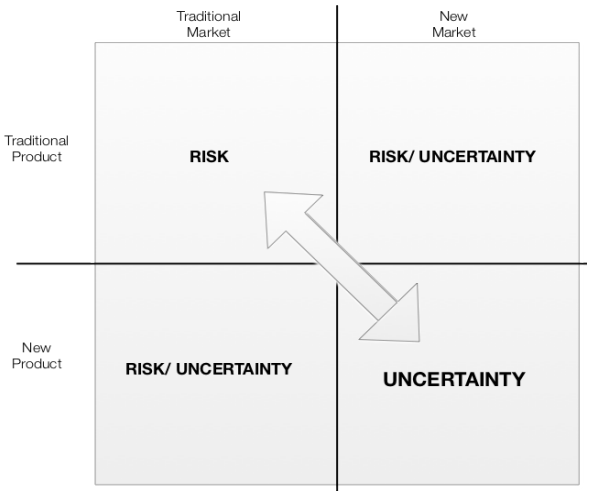


Figure 5. Right- bottom quadrant, the suicide quadrant, here, traditional marketing techniques are ineffective due to uncertainty (Sarasvathy, 2001).

Designers are trained to understand social interactions and recognize changes in consumer trends and behaviours, these characteristics along the tools they have to materialize solutions help them convert these changes into opportunities (Valencia, 2016). Table 1 shows the Effectuation and Causation principles identified by Sarasvathy (2001; 2005).

Table 1. Principles of effectual logic vs Casual logic (Sarasvathy, 2001; 2005).

Effectuation	Causation
Start with your given means: The entrepreneurs imagine possibilities that originate from their means. Who I am, what I know, and whom I know.	Pre-set goals or opportunities: Causal reasoning works inversely by assembling means after a goal is set.
Affordable loss principle: Focus on the downside risk. Expert entrepreneurs limit risk by understanding what they can afford to lose at each step, instead of seeking large all-or-nothing opportunities.	Expected return: Causal reasoning first targets a return, then works to minimize associated risk.
Leverage contingencies: Instead of making "what-if" scenarios to deal with worst-case scenarios, experts interpret "bad" news and surprises as potential clues to create new markets.	Avoiding surprises: Causal reasoning works to minimize the probability of unexpected outcomes.
Forms partnerships: Experts reduce uncertainty and co-create the new market with its interested participants.	Competitive analysis: Causal reasoning presumes that competitors are rivals to contend with.
Control vs prediction: By focusing on activities within their control, expert entrepreneurs know their actions will result in the desired outcomes. An effectual worldview is rooted in the belief that the future is neither found nor predicted, but rather made.	Inevitable trends: Causal reasoning accepts that established market forces will cause the future unfold.

According to Reymen et al (2015), in the face of uncertainty, entrepreneurial studies have different approaches. There are ones that emphasis control and planning and others that more adaptive, collaborative and flexible (like effectuation and bricolage).

A study conducted by Nil Gulari in 2015 showed small and medium enterprises have a greater tendency to pursue incremental innovations rather than radical innovations, clearly showing that they avoid taking the risk. Design thinking encourages experimentation and risk-taking by proposing fail early to succeed sooner¨(Brown 2009).

Here is a hint that designer ways of knowing and doing (Cross, 1982) connects with sophisticated ways of starting up a business. According to Blank (2013), the most famous author in the lean start-up methodology, successful companies "go quickly from failure to failure, all the while adapting, iterating on, and improving their initial ideas as they continually learn from customers".

2.4.5 The lean start-up

The Lean start-up[1] approach was created for Silicon Valley's tech start-ups, to decrease risk in new ventures, replacing the traditional business plan with a list of hypotheses to be verified and swapping the entrepreneur's intuition with the customer feedback (Girgenti, 2016).

This method favours:

Experimentation over Planning,

Customer feedback over Intuition,

Iterative Design over Traditional "big design up front" Development.

Blank suggested that "Lean start-ups entrepreneurs don't begin with a business plan; they begin with the search for a business model. Only after quick rounds of experimentation and feedback reveal a model that works, so founders can focus on execution" (2016).

By developing the product incrementally and iteratively, agile development eliminates misused time and resources. It's the process by which start-ups create the minimum viable products they test. In the same way, Design uses rapid prototyping to test faster their concepts, having the customers´ feedback as a guideline to co-create better solutions.

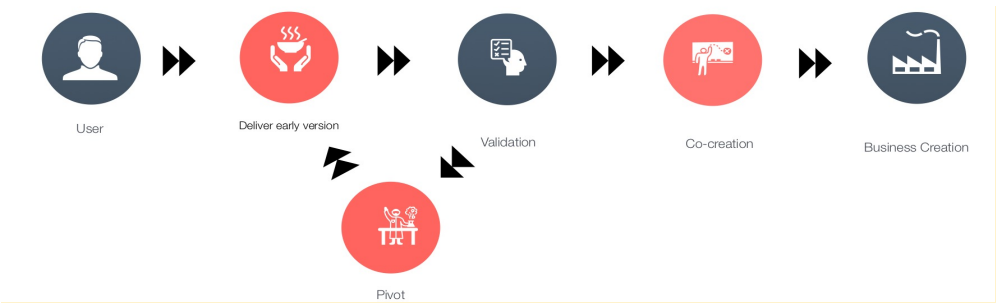


Figure 6. The lean start-up model by Blank (2012).

In the same way, Design methods enable to hear, build and deliver value to the user. Everything starts with few statements, including budget-time constraints, target customer, user´s needs, and technical requirements; but this brief is loose enough to let designers find out the real

[1] *Lean Startup* is a methodology for developing businesses and products. It aims to shorten product development cycles by adopting a combination of business-hypothesis-driven experimentation, iterative product releases, and validated learning (Ries, 2008).

need and the best way to create value. Here, similarities arise from the fact that Lean start-up methodology listen, build, experiment, learn and deliver as well as the Design process.

2.5 Similarities between Design process / Effectual logic / Lean start-up

Expert entrepreneurs look forward to reducing the cost of failure by enabling the failure to occur earlier and at lower levels of investments. They believe in a Yet-to-be-made future. Entrepreneurs tend to find ways to reach the market with the minimum expenditure of resources like time, effort and money (Sarasvathy, 2008). According to Tom Kelly et al. (Kelley and Kelley 2013), one of the principles of design thinking is to fail prototype as soon as possible to test with the user, allowing failing sooner to learn faster. Failure "sucks but instructs" (Sarasvathy 2001).

Table 2. Differences between effectual and casual logic (Sarasvathy, 2001).

Issue	Causal frame	Effectual frame
View of the future	Predictive. Causal logic frames the future as a continuation of the past. Hence accurate prediction is both necessary and useful.	Creative. Effectual logic frames the future as shaped (at least partially) by willful agents. Prediction is therefore neither easy nor useful.
Basis for taking action	Goal-oriented. In the causal frame, goals, even when constrained by limited means, determine sub-goals. Goals determine actions, including which individuals to bring on board.	Means-oriented. In the effectual frame, goals emerge by imagining courses of action based on given means. Similarly, who comes on board determines what can be and needs to be done. And not vice versa.
Predisposition toward risk and resources	Expected return. Causal logic frames the new venture creation problem as one of pursuing the (risk-adjusted) maximum opportunity and raising required resources to do so. The focus here is on the upside potential.	Affordable loss. Effectual logic frames the problem as one of pursuing adequately satisfactory opportunities without investing more resources than stakeholders can afford to lose. The focus here is on limiting downside potential.
Attitude toward outsiders	Competitive analysis. Causal frames promulgate a competitive attitude toward outsiders. Relationships are driven by competitive analyses and the desire to limit dilution of ownership as far as possible.	Partnerships. Effectual frames advocate stitching together partnerships to create new markets. Relationships, particularly equity partnerships drive the shape and trajectory of the new venture.
Attitudes toward unexpected contingencies	Avoiding. Accurate predictions, careful planning and unwavering focus on targets form hallmarks of causal frames. Contingencies, therefore, are seen as obstacles to be avoided.	Leveraging. Eschewing predictions, imaginative re-thinking of possibilities and continual transformations of targets characterize effectual frames. Contingencies, therefore, are seen as opportunities for novelty creation — and hence to be leveraged.

In the table above, the main characteristics of the causal and effectual logic are described. In the table below, the view of the future of the Causal vs Effectual logic is shown.

Table 3. Description of casual and effectual logic (Agogue et al., 2014).

View of the future	Causal logic	Effectual logic
Basis for Taking Action	*Should:* Focus on optimal scenarios and reaching preset goals. Start with given goals.	*Can:* Focus on doing the doable and pushing it forward. Start with given means: who you are, what you know and who you know.
Attitude Toward Risk	*Expected return:* Calculate upside potential and pursue the best opportunity	*Affordable loss:* Calculate downside potential and risk no more than you can afford to lose
Attitude Towards Others	*Competitive:* Set up transactional relationships with customers and suppliers	*Co-creational:* Build your market together with customers, suppliers and even potential competitors
Attitude Towards the Unexpected	*Avoid surprises*	*Leverage surprises*
Underlying logic	Prediction: The future can be readily predicted. To the extent we can predict the future, we can control it.	Control/Design: Using strategies for creating a future. To the extent we can control the future, we do not need to predict it.

Universities have been training experts on uncertainty, human-centred professionals and disruptive thinkers, also known as Designers. The logic developed by designers and by the expert entrepreneurs has several points in common. In the next table, there is a comparison between design methodologies (in General), lean start-up, and Traditional "by the book" new venture creation.

Table 4. Comparison between design, lean start-up and traditional new venture creation, based on Blank (2014) and Hekkert (2013).

	Design Methodology	Lean Start-up	Traditional
Strategy	User Centered Design	Business Model	Business Plan
	Experimentation Driven	Hypothesis Driven	Implementation Driven
New-Product Process	Co-creation	Customer Development	Product Management
	Rapid prototyping	Test Hypothesis	Step-by-step planning
Engineering		Agile Development	Waterfall Development
	Iterative loops	Iterative and Incremental aproach	Fully specify the product before development
Organization	Multidisciplinary teams	Agile development teams	Departamental
	Flexible minds	Nimbleness	Experience
Failure	Trial and error	Expected	Exception
	Adaptive	Pivoting away from ideas that doesn´t work	Fix by firing executives

2.5.1 The sub-processes of innovation

Science & Technology are about creating novel understandings, knowledge and transformations of the world and a systematic way to approach it. Design and entrepreneurship overlap in peruse of novelty. In the case of design, it concentrates its attention to develop modern devices and products whereas in the case of entrepreneurship, the attention points out to the establishment of new business (Luo, 2015). These three processes characterized by creativity are different to manufacturing, quality assurance and logistics, for which repetition is essential. Entrepreneurship, Design and Science & Technology are all creative processes. If an organization unites the innovation process between these three factors, the opportunity to innovate across organizations and ecosystems will be fostered (IBM have in-house the three factors), but not every organization can afford those expenses. We need to focus on the constraints of start-ups and in SMEs, the way they do business and the resources they have. How we can help them to thrive and succeed with the tools of *Design Driven Innovation* (Verganti 2013) remains to be seen.

Krippendorf (2006) suggested that the post-industrial era present a paradigm shift from the industrial era. The ontological explanation changed from mechanical/causal to the ability to create, construct and realize, and on Design, matters changed from technology-centred to Human- centred. New scientific and technological discoveries are a key element in innovation; nevertheless, it must go all the way through into a company, start-up or an enterprise to make its impact on the community. The value created by a firm can be measured by the amount that customers are willing to pay for a product (Mishra, 2009). The way the enterprises get closer to their customers is the way they defined their products characteristics. This sets the core profile in companies that try to approach to innovation, either incremental or disruptive.

2.5.2 Milestones in the innovation processes

Based on Salerno (2014) there are eight types of innovation process:

The linear one (traditional); The process started by a call; the process with a parallel activity, the process that starts with a specification from the client; the tailor-made project; the process with a stoppage waiting for technology; the process with a stoppage waiting for the market and the process with a stoppage waiting for the technology and the market.

2.5.2.1 Idea generation

Idea generation is considered by business literature as the systematic search for new product ideas (Law, 2009), yet, it can be unsystematic or spontaneous as it was discussed in Chapter 1. This milestone is important for the study to find out if there is a particular way the Designer Entrepreneurs come up with creative insights.

2.5.2.2 Idea predevelopment

In this study, the concept of idea predevelopment explores the concept of the product and its definition, usually after a preliminary study (Design society, 2005). This step could potentially show how designers explore the soundness of the idea.

2.5.2.3 Product Development

The product development is not a short-term milestone. In this study, this stage consists of turning a prototype or concept into a workable market offering (Rouse, 2019). This milestone can extend in time due to the intricacies of developing a product, yet it is expected that the participant shows the starting and ending point.

2.5.2.4 Funding

This stage provides financial support to start-ups to finance the project. It is commonly accepted that this term is used when the founders fills the need from cash from their own savings (Law, 2019).

2.5.2.5 Rise Capital

This stage refers to the money obtained externally to get the business off the ground and help the daily operations, such as purchasing materials and paying wages.

2.5.2.6 Validation

In this study, the validation indicates the assessment of the idea, product or the start-up and the verification of the acceptance from potential customers or stakeholders and also if they are being implemented as intended (Business Dictionary, 2019; Cambridge Dictionary, 2019).

2.5.2.7 Crowdfunding

In this research, crowdfunding is a way to raise finance from a large number of people, typically using an online platform, where the project is subject to pledges (UK Crowdfunding, 2019).

2.5.2.8 Pivoting

This stage refers to the abrupt change that companies may do to their business model, in response to or in anticipation of a change in the market.

2.5.2.9 Minimum Viable Product

For this study, the definition of a Minimum Viable Product (MVP) is the most reduced version of a product that can still be released (Technopedia, 2019).

2.5.2.10 Mentorship

In this study, the mentorship stage is when a mentor influence, guide, or directs the Designer Entrepreneur. The mentor is responsible for providing support to, and feedback on, the individual in his or her charge (Merriam-Webster dictionary, 2019; Business dictionary, 2019).

2.5.2.11 Diffusion (spread the word)

The diffusion stage refers to the communication process in which the entrepreneurs explain their ideas, information, product and start-up to their community or society.

2.5.2.12 Wait to develop the market

This stage is when the entrepreneur decided to stop other areas of the business to develop the existing market rather than looking for a new market. The company looks for new buyers to pitch the product to a different segment of consumers in an effort to increase sales (The Economic Times, 2019).

2.5.2.13 Wait to develop the technology

This stage is when the entrepreneur decided to stop other areas of the business to develop the technology by systematically use of scientific, technical, economic and commercial knowledge to meet specific business objectives or requirements (Business dictionary, 2019).

2.5.2.14 Outsource

This stage indicates the practice of subcontracting another company to perform services and create goods that cannot be performed in-house.

2.5.2.15 Manufacturing

This stage points out the process of converting materials, components, or parts into the finished product.

2.5.2.16 Sell

This milestone indicates the exchange of money for the final product. It can be online, in a departmental store or in an independent store.

2.5.2.17 Distribution

This stage points out the milestone of moving the product through a distribution channel to the final customer, customer or user. This process includes the logistics between all the elements involved.

2.5.2.18 Intellectual property

This milestone represents the need to protect the creative idea from entrepreneur.

2.5.2.19 Rapid prototyping

In this study, the entrepreneurs utilized a computer-generated model to create rapidly from a CAD drawing, typically utilizing additive manufacturing.

2.5.2.20 Market research

This milestone refers to the activity of identifying the size of the market, the user´s unmet needs, and potential threats for the company, and market opportunities. Also, it analyses the characteristics of competitive products.

Read more: http://www.businessdictionary.com/definition/market-research.html

2.5.2.21 Resources evaluation

This research refers to the resource evaluation milestone to the activity where entrepreneurs evaluate thier resources: materials, human capital, tools and funds.

To reduce the complexity of the previous maps, a friendlier version of it was created, containing the basic steps. Since this map is going to be used in a think aloud activity, the imagery has to tap into colours, shapes and simple forms, to allow the participant to focus on recalling their process instead of trying to decode the meaning of the milestones of each process.

2.5.3 Start-ups profile-approaches to innovation

There is a widely held view that business innovates through either technology-push or market-pull strategies. But Booz Allen & Company (2012) revisited this longstanding idea through their annual innovation survey of over 1000 business. They found out three major strategies for enterprises. For the first one, they used the term Technology-Driven companies. These companies are driven by cutting edge technology or scientific findings (Tech & Science driven). These

companies rely on their technological capabilities or state-of-the-art discoveries, and they spend significant resources in R&D to achieve a natural barrier among their competitors to not allow them to copy or improve their products. This gives them a gap of time to take advantage of this investment before rivals can respond. According to Peter Thiel (2014), innovation on the latest scientific discovery or knowledge establishes a sustainable monopoly on the part of the company that commercializes it. The problem here is this profile is far from the user's needs and it can drain the resources of a company before it became a hit in the market. In fact, Booz Allen & Co. report (Ibid) research shows that the proportion of turnover spent on R&D activity cannot predict commercial success.

The second category identified by Booz Allen & Co. are called Market Readers. These are companies' innovation strategies focused on spotting and following trends in their markets. These companies monitor their competitors' failures and their success. They focus their attention on their competitors in each category (instead of on the user) and make product-range decisions accordingly. This helps them to approach cautiously newer ideas, since they can rely on quickly following the success of others. This profile is unable to create breakthrough innovation. If their competitor is heading to failure in one category, these companies may do so as well, but they manage their overall risks by adopting this second-mover strategy. This profile requires copying as fast as it can.

Booz Allen & Co (Ibid) introduced a third strategy/profile, one driven by generating insights into the user's needs. They called this category Need Seekers. Design-led innovation is likely to match with this profile. This profile engages actively and directly with their customers, to co-create new products and services from a deep understanding of the customer needs, desires, pains, and fears. This last profile matches with the design-driven companies, innovating as part of their culture and daily practices. The end-user and the stakeholders communicate in different codes and contexts. Krippendorf (2006) suggested the human-centred approach is concerned with how stakeholders attribute meanings, and since meaning is acquired in use and not design, decisions on meanings ultimately cannot be taken away from those who are affected by design. Understanding end-user or stakeholder requirements need to have a holistic view of the phenomena and a deep understanding from every member of the team to have a common goal and a common methodology. Design strategist moved away from asking people in isolated environments (like focus groups) run by the marketing team to a practice-based design (going deep with the

community in situ, co-creation, and open innovation teams). This builds up the basis for interdisciplinary teams and bigger goals. Accordingly, to Verganti (2008), this approach will give the opportunity to be more meaningful and transcendent with the outcomes.

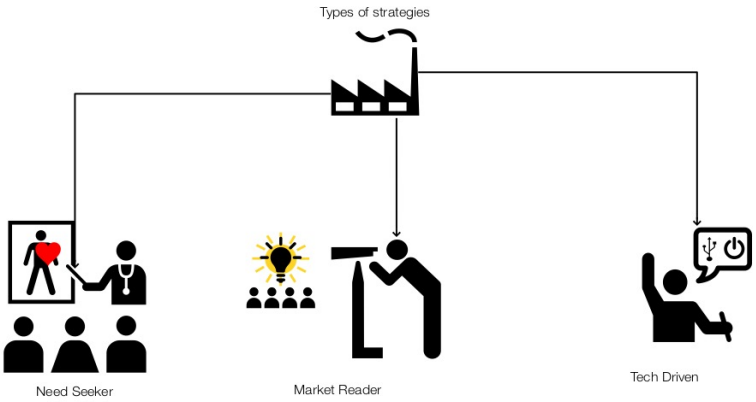


Figure 7. Types of strategies according to BACEI & Booz & Company Report (2012).

In other words, the Technology Driven (TD) companies, rely on their technological capabilities to offer value. The Market Readers (MR), generate ideas by closely monitoring the market and competitors. The Need Seeker (NS) company follows the Design Centric Approach (DCA) that tends to look for insights into both the articulated and inarticulate needs and desires of their customers (Booz & Co, 2013).

In Silicon Valley, California, USA, the NS companies outperform their peers in both profitability and enterprise values. Nearly half of Bay Area companies are NS, compared with less than a third of all companies surveyed in the 2011 Global Innovation 1000 study (Jaruzelski, 2011). The innovation process within companies using design is exemplified through different approaches, these include design thinking (Brown, 2009) and design-driven innovation (Verganti, 2013). According to Brown, design thinking brings into balance the 3 constraints that create successful products: Desirability, Viability and Feasibility. In his own words, Brown (2007) said that Design thinking "uses the designer's sensibility and methods to match people's needs with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity". For Verganti, Design-driven innovations do not follow the market, they create new markets by pushing new meanings (2009). Design has proved to add value to existing firms (National Agency for Enterprise & Housing 2008) and would be expected to provide

an even better results for start-ups2 embracing a design-centric approach at the outset (Petersen, 2015).

2.5.3 New products in new markets

Petersen (2016) broadened the understanding of the Ansoff matrix (Ansoff, 1957) expanding the knowledge of disruptive technologies and markets and how they deal with risk and uncertainty. Similarly, Frog Design, through its spinoff for start-ups called Venture Design, expanded the Ansoff Matrix (Frog Design, 2017). It helps to visualise the possible growth areas in an organisation, whether they are start-ups, spinoffs or established companies.

Figure 8. Ansoff matrix expanded (Frog design, 2017).

[2] A start-up (known also as startup) is an entity, registered partnership firm or a limited liability partnership, working towards innovation, development, deployment, and commercialization of new products, processes, or services driven by technology or intellectual property (Ministry of Commerce and Industry, 2016).

As we can see in the bottom left quadrant, companies located in traditional markets and traditional processes are looking to penetrate the market. Stakeholders know what to expect from their offerings, and the acquisition cost is not high since the awareness of the product is there. Previous products and competitors have been around with a similar offering. Causal logic works appropriately under this condition since its tools rely on a numerical foundation to recognize the opportunity, that is, the opportunity exists independent of the actions of the entrepreneur, just waiting to be detected and exploited (Sarasvathy, 2008; Alvarez and Barney, 2007; Shane and Venkataraman, 2000). It focuses on what needs to be done to achieve the established goals with all possible means. It is objectively driven.

One of the biases within this doctrine is a reliance on forecasting and prediction. The goal is set at the beginning, and the entrepreneur has to find a way to make that objective happen. The challenge is when there is little available information on which to base the predictions, so the projection of the future is not reliable. The exploration of new-to-the-world product concepts and the targeting of newly created markets (top right quadrant) is different. Sometimes called Blue Ocean Strategy (Kim and Mauborgne, 2004) it demands an experimental mindset since the primary objective is not to improve an existing offering but to define entirely new value propositions. This type of entrepreneurial activity operates in a climate of uncertainty, where companies or start-ups don't know what they don't know. There are often numerous unknowns including the size of the market, customer acquisition costs, and reliability of the product, market share, product lifecycle, technological readiness and the product's functional and aesthetical attributes. The complexity precludes a scientific approach to prediction, taken along with unexpected events affecting the context for such new-to-the-world concepts.

2.6 Design Entrepreneurship

Gunes in 2012, described the Design Entrepreneurship's goal as "producing and marketing the intellectual properties of a viable concept in terms of assuming risks, financing and management responsibility". Start-ups are temporary organisations founded by entrepreneurs who are looking for a scalable, repeatable and profitable business model (Blank and Dorf, 2014). NEA (2016) published a study about the future of design in start-ups, where 85% of companies have founders or chief executives that weigh-in on design decisions.

When the invention has successfully implemented an innovation is acknowledged (Hennessey, 2010), No matter if it is a start-up, spin-off or spin-out, the process by which new

inventions reach the market is the entrepreneurial process (Luo, 2015), and thus the effectual logic is vital. Accordingly, with Gautam and Singh (2008), product innovations consist of the following three aspects: New form / new function, new look / new feel and new technologies, all of which have a strong relationship with the Design goals.

The entrepreneur creates a new business in the face of risk and uncertainty for the purposes of achieving profit and growth by identifying significant opportunities and assembling the necessary resources to capitalise those (Peters et al., 2009).

There are several definitions for the word entrepreneurship, According to Filion (2011) "an entrepreneur innovates by recognising opportunities; he or she makes moderately risky decisions that lead into actions requiring the efficient use of resources and contributing an added value". Likewise, according to Parthasarathy (2011), an entrepreneur is "a person who becomes immersed in an innovative entrepreneurial endeavour, defined as the process of starting a new business, organisation, product, or service that fulfils a vision", for Ries (2016), the concept of entrepreneurship "includes anyone who works within the definition of a start-up: a human institution designed to create new products and services under conditions of extreme uncertainty".

The European Commission (2010), included in its Flagship Strategy 'Innovation Union' Design as a key priority stating that: "Although some European countries are world leaders in design, others lack a robust design infrastructure and design capability in companies and engineering schools. This systemic gap has largely gone unnoticed but must now be tackled".

Most innovative companies obtain 75% of revenues from products or services that did not exist five years ago (Cox, 2005). This indicates organisations rely on increasingly strong innovation in their products to remain in force in the market. The UK job market within the creative sector growth was ahead of the rest of the national average by over five times and generated for the UK economy £70 billion annually. (Design Council, 2012, Business News, 2014). The UK government in 2001, declared that "those industries which have their origin in individual creativity, skill, and talent and which have a potential for wealth and job creation through the generation and exploitation of intellectual property are part of the creative industry. Based on the Gross Domestic Product, The UK has one of the largest creative industry sectors in the world (CBI, 2015), employing about 232,000 designers (DC, 2010), of which almost 24% are freelancers (Elance, 2011). The definition of creative industries given by the United Nations (UNCTAD, 2008) is every industry that involves the creation, production or distribution of goods and services that use

creativity and intellectual capital as their primary input. These activities are found in the 4th sector of the economy, scientist pursues discoveries through analysis, but inventors pursue invention through synthesis. These two roles are considered creative profiles (Owen, 2006), inside this sector.

The way that SMEs and large enterprises innovate is different (Mosey, 2005; Audretsch, 2001; Caputo, 2002). NPD requires a multiple set of specialists, from engineering to marketing backgrounds. According to Milton and Rodgers, there are four major components of NPD: research, engineering & industrial design, marketing, and manufacturing (Milton, 2011). However, this model works mostly in large organisations and large-scale projects. Nevertheless, there is a growing demand for smaller-scale projects involving a smaller and adaptable individual with flexible skill sets (Elaver, 2015). There is an opportunity to study successful start-ups, how they support the necessary elements of the innovation process in an adaptable/flexible way and how designers contribute in that effort.

2.6.1 Design Entrepreneurship framework - typology

In some high-profile success stories, the role of Design as a strategic driver in business is being increasingly recognised and discussed. Many major business management consultancies have acquired design agencies in recognition of Design as a method-set or tool-set for business innovation (Maeda, 2016). However, much of the data on how this phenomenon translates into the design role in entrepreneurial start-ups remains on a case-by-case basis, making generalisation of principles and approaches difficult. This is compounded by overlapping definitions of entrepreneurship, seen from several different disciplinary perspectives. Through the discussion section, this paper has begun to identify common themes in this mixed literature and to clarify distinctive mindsets. Although it remains as a work-in-progress, these mindsets have been discerned and modelled as a conclusion to this paper into a preliminary typology (figure 9). The model attempts to separate the distinctive elements of design approaches from three critical theories of general (non-design-led) entrepreneurship. The value of this typology will be to interrogate real designer entrepreneurs to understand the changing role of Design.

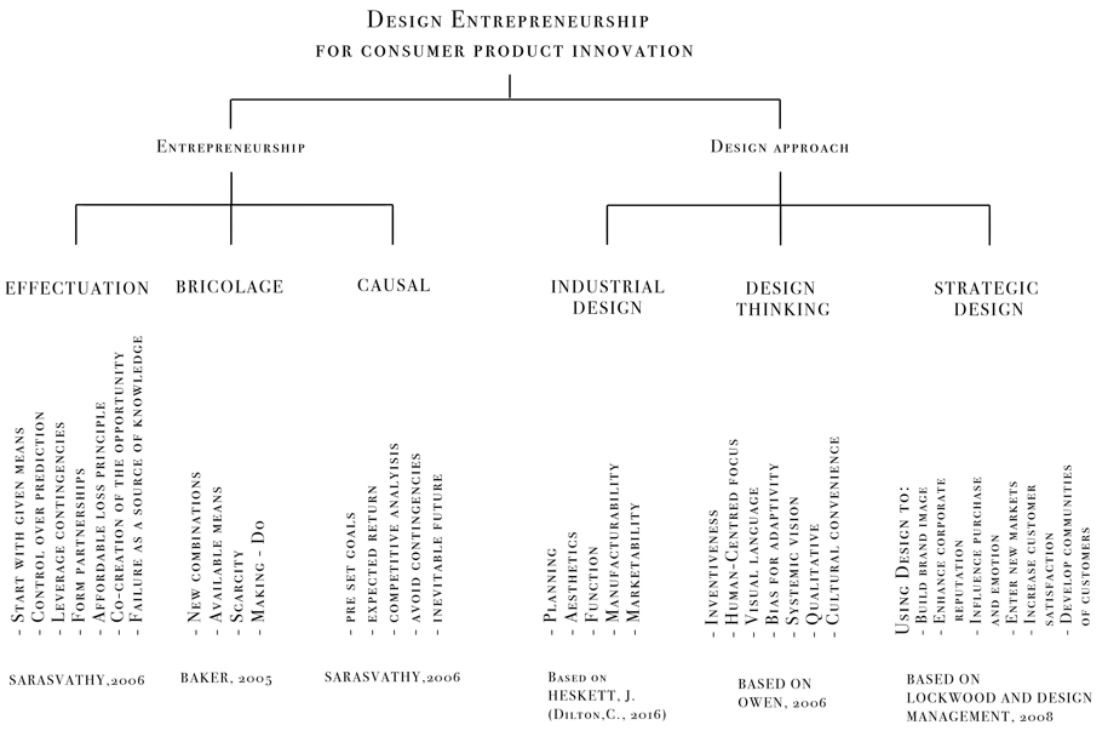


Figure 9. Design Entrepreneurship for Consumer Product Innovation (DECPI) Preliminary typology.

According to Hammersley and Atkinson (1995), a typology helps the researcher to move beyond the description and explanation of the phenomena. This typology is the basis to decode the actions taken by designer-entrepreneurs while they are starting up their consumer product business. Therefore, the value of this typology is to use it as a taxonomy, to analyse the decisions made from the idea to the validation of the product. Its utility is to assist the correlation and integration of theory and practice, leading to improved understanding and articulation of potential paths to successful entrepreneurship.

2.6.2 Using the preliminary typology as a theoretical framework

This typology will be used as a priori code in the analysis phase of the study. The need for a theoretical framework in Constructivist Grounded Theory has been introduced by Charmaz (2006), arguing the need for an open-minded researcher, not an empty-minded researcher.

This study is inspired by the Constructivist Grounded Theory approach. In Chapter 3.1.9, this paradigm is explained in detail. The traditional Grounded Theory approach promotes the avoidance of literature review before the data is collected, to prevent interference of the researcher´s previous ideas into the coding and analysis of the information. However, in the constructivist approach of Grounded Theory, the theoretical framework developed from the

literature review does more than summarize the conceptual underpinnings of the manuscript. It is also used to extend, refine, and challenge existing ideas and concepts (Charmaz, 2008). Charmaz (2006) suggest that the theoretical frameworks help acknowledge prior theoretical works and engage leading ideas. Theoretical codes can be used to sensitize the audience to support the explanation of the ideas.

CHAPTER 3 - RESEARCH METHODOLOGY

3.1 Introduction to the chapter

The literature review showed that there is very little published to date on designer entrepreneurs. Further research aiming to understand this field would, therefore, be of value to the academy and very likely to the business community as well. On that basis, this research sets out to explore the learnings resulting from the transition from designers to entrepreneurs.

Theories from both Business and Design disciplines will be used as a framework for the investigation and analysis. This methodology intends to identify commonalities between the *Design Approach* introduced in the literature review and contemporary theories of entrepreneurship, to how they are/are not integrated with the role of designer-entrepreneur.

From a business perspective, there are recent theories that help to understand the entrepreneurial process. The first theory used in this research is called Effectuation (Sarasvathy, 2001). This theory is the result of a longitudinal study of the decisions entrepreneurs made when they started up their businesses. Grounded theory was utilised by Sarasvathy to come up with this theory. It analyses entrepreneurs in their decision-making processes. The second one is called Bricolage (Baker & Reed, 2005). This theory taps into previous research done by Lévi-Strauss (1967) who came up with the concept of "bricolage," which means make-do with whatever is at hand. Grounded theory was utilised to analyse small firms' process to thrive and how they get by in constraint environments. It analyses entrepreneurs when they need to "create something out of nothing (Baker & Reed, 2005)". These theories target on creating something from nothing, and their value proposition is focused on the product progress over planning. In the case of the Design discipline, the approaches taken for this study are Design thinking (Brown, 2008), Industrial Design (Heskett, 2016) and Strategic Design (Calabretta, 2017). Design thinking encourages creativity in decision-makers (Owen, 2006). The designer's methods and sensibility concentrate on solving people's needs by having in mind the business viability and the technological feasibility of the product (Brown, 2008). Industrial design deals with the aesthetics, manufacturing, usability and functionality of a product (Heskett, 2016). The strategic design utilises the tools and methods of the Design discipline and uses them to give direction to the entire organisation and change its culture.

A set of questions have been integrated into a semi-structured interview (detailed further below), and a set of activities were set up to support the collection of data. This primary data

collection will take place among entrepreneurs with a background in design, working in a consumer product start-up.

3.1.1 Research question

What is the designer's transition to become an entrepreneur in product-based start-ups?

3.1.2 Objectives of the research:

- Exploring the designer's transition from being a designer to becoming an entrepreneur.
- Describing the new product development and the new venture creation processes.
- Identifying the milestones of the entire entrepreneurial journey.
- Comparing the designer and the non-designer entrepreneurial journey
- Understanding of the process and its implication on the evolution of the Designer mindset.
- Discovering if there are new principles that Designer Entrepreneurs can contribute to the current theories of entrepreneurship and design.
- Identifying the interaction between the two disciplines when designers are starting a new venture.

3.1.3 Motivation for the research

This research contributes to the understanding of a phenomena insufficiently explored by academia to date. It also tries to add to the base of knowledge of design practitioners and what they can do to realise their ideas in society, for social, cultural and economic impact.

3.1.4 About the author

The researcher in this study has a background in automation engineering. He has worked as a lean manufacturing engineer, technical manager, design lecturer and business consultant. He has got a master's degree in innovation and design. A more detailed breakdown of his experience and background can be found in Annex H.

3.1.5 Philosophical assumptions

3.1.5.1 Ontology

As Saunders (2009) states "Ontology refers to the assumptions about the nature of reality, it is considered how the researcher sees and study the research objects." These are the elements or variables that become the focal point to study in the investigation.

For Al-Saadi (2014), ontology concerns about "our beliefs; about what exists", the kind and nature of reality and the social world. The existence of social structures, cultural norms and social actors and their relationship between each other are concepts that ontology study (SAGE, 2006). Ontological issues have significant implications in research, whether the reality is considered external to social actors or is people's dependant and subject to interpretations (Bryman, 2016).

In the case of this study, one ontological assumption is that Designers perform differently than non-designers when they set up a business. Another ontological assumption is that there is a designer's transition that is experienced once the business goals and the product development goals combine, forcing the designer to adapt, adopt and apply skillset from other disciplines but with their interpretation and unique execution. These ontological assumptions became the main objects to study in this investigation.

This research assumes that the issue of design-based entrepreneurship depends on the personal experience of each designer entrepreneur of the sample and their social factors; therefore, there are multiple realities to study. This asseveration rules out objectivism/realism from the philosophical approaches of the research since the reality explored by both of them is a single social reality and independent of the social factors.

3.1.5.2 Epistemology

As Burrell and Morgan (1979) cited by Saunders (2009 p.127) "Epistemology refers to the assumptions about knowledge, what constitutes acceptable, valid and legitimate knowledge and how the researcher can communicate it to others". Jupp (2006, p.92) defines it as "a field of philosophy concerned with the possibility, nature, sources and limits of human knowledge" (Jupp, 2006, p. 92). Epistemology studies whether or how knowledge of the reality can be gained. It is a way of looking at the world and makes sense of it (Crotty, 1998).

To summarize the before mentioned in a simple question would be: how do we gain knowledge? Due to the multidisciplinary nature of Management and Design, multiple types of knowledge can be explored. The epistemological assumption for this research study includes narratives, stories, facts and interpretations of the entrepreneurial journey of the participants to help the study build the knowledge of the issue.

3.2 Research philosophies

The research philosophy is the set of beliefs about how the study evolves, how the data is collected and analysed. It is vital to formulate the beliefs and assumptions that will delimit the study. The following lines explain the major research philosophies.

3.2.1.1 Positivism

It concentrates on the importance of evidence in searching for the truth, without the bias of the researcher. Values and facts are considered in different categories; this differentiation allows the researcher to conduct value-free and objective studies (Snape & Spencer, 2003).

Positivism calls for the following basis:

If the senses can confirm the phenomena, it can be considered as knowledge:

- The central argument for this theory is that the hypothesis needs to be tested to allow explanations later; this is also known as Deductivism (Bryman, 2016).
- Knowledge is achieved by gathering facts that provide the basis for laws; also known as Inductivism.
- Moreover, lastly, science ought to provide value-free and objective outcomes.

3.2.1.2 Naturalistic Paradigm

The naturalistic enquiry examines the experiences of the subject in its natural settings. The scope provided by the naturalistic approach is subjective and depends on the researcher's interaction with the subject and its context (Lincon & Guba, 1985). There are 5 basic axioms that drive the naturalistic enquiry (McLannes, 2017):

- To understand the reality, it is necessary to understand the context.
- The relationship between the known and the knower is inseparable.
- Statements are bound by time and context
- It is not possible to differentiate effects and causes.
- The enquiry is value-bond.

3.2.1.3 Interpretivism

Contrary to positivism, the subject plays an active role in the construction of the social world that leads to the explanation of human behaviour. This is fundamentally different from the natural sciences since social reality refers to human actions being meaningful; thus giving meaning to human beings (Bryman, 2016).

3.2.1.4 Objectivism

It uses the paradigm of natural sciences to study human reality and knowledge. It employs methods such as hypothesis testing, causal explanations and modelling similar to the ones used in the natural sciences (Al-Saadi, 2014). It is an ontological position that states that social phenomena and their meanings are independent of social actors (Bryman, 2016). In other words, the reality is outside the researcher, and it resides in the object, hence the truth is static and objective. The end goal for positivism and objectivism is to determine a generalizable and replicable knowledge based on objectivity.

3.2.1.5 Subjectivism

Contrary to Objectivism, Subjectivism backs the idea that the nature of the reality is socially constructed. In the case of this research, the opinions of the members of the entrepreneurial ecosystem, as well as the Designer Entrepreneurs involved, are shaping the reality. For Gray (2014, p. 48), in subjectivism "the meaning is imposed on the object by the subject. Subjects construct meaning from collective unconsciousness, dreams and religious beliefs".

3.2.1.6 Constructivism

The perception and interpretation of reality cannot fit under the previous paradigm. Based on the reflection of events and experiences, understanding arises by exploring and understanding the social world by concentrating the study on the meaning and interpretation. This taps into the human capacity to understand fellow human beings from the inside, through empathy, shared experience and culture (Hammersley, 2013).

For constructivist, knowledge is constructed not discovered, and depending on the subject, the meaning of the same phenomenon can be constructed in different ways (Gray, 2014). For Charmaz (2006), constructivism is a scientific perspective on how realities are built. Researchers and people construct realities in which they co-exist and participate. Constructivism acknowledges that the researcher´s interpretation of the studied phenomenon is itself a construction.

3.2.1.7 Hermeneutics

Hermeneutics is knowledge that cannot be considered independently of the person knowing it. Every person and all knowledge are embedded in a context. It is observation within an interpretation, within a context, within a specified period.

3.2.1.8 Phenomenology

From the phenomenological stand, grasping the essence of a phenomenon has to be approached subjectively and intuitively.

Phenomenology examines the conscious experience of an event, as experienced by the researcher. Three different methods of interpretation are:

- Transparent description of experienced events.
- The interpretation of experiences by connecting to relevant environment.
- Analysis of the form of an experience.

3.2.1.9 Pragmatism

It requires the researchers to be exclusively concerned with practical issues. Here, knowledge is temporary, useful as long as it is practical.

3.3 Research approaches

3.3.1 Deductive, Inductive or Abductive

Deductive thinking starts from general to specific statements or hypothesis. The conclusions are reached using the available facts (Burney and Saleem, 2008). It is considered a top-down approach. Inductive thinking is a bottom-up approach. For Kumar (2011), the use of inductive reasoning aligns with the qualitative research paradigm; it allows the problem to be reformulated iteratively after the data collection has begun. Figure 10 made by Kumar (2011) summarizes this.

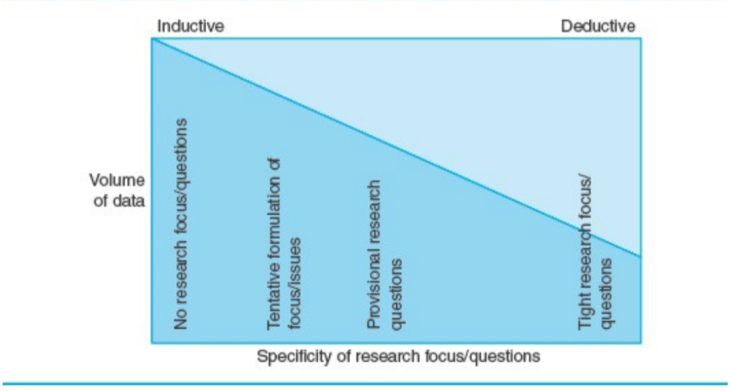


Figure 10. Inductive or Deductive reasoning for the research (Kumar, 2011).

Abductive thinking: In such type of study, the designer's contribution is to add imaginative thinking and selecting one of the multiple explanations to the issue or phenomena. Abduction starts

examining the data and giving all possible explanations for the observed phenomena (Charmaz, 2006). Abductive reasoning is a form of reasoning that generates and evaluates hypotheses to make sense of puzzling facts. Abductive reasoning fits complex situations and may address many of the challenges of complexity (Dunne and Dougherty, 2016). The outcome of an abductive approach is no certain, but it helps to navigate complex problems. It uses information available, and it digs for data to recreate events from the past to help draw better conclusions.

3.3.1 Quantitative and Qualitative methods

After developing the framework, the methods explored to delve and discover new insights in this field were quantitative and qualitative. The quantitative methods were discarded from this study, due to their inability to provide an understanding of why or how Design Entrepreneurship takes place. The quantitative approaches can offer validated instruments to the typology developed from the literature. However, the scope of these approaches is deterministic and framed by a disciplinarian perspective (in this case, management) without considering the design perspective. On the other hand, qualitative research opened the opportunity to respond to fundamental questions of the research by allowing a multidisciplinary framework integrating design and business entrepreneurship from the outset.

3.4. Research strategies

The selected approach for this study is qualitative, based on the facility to enable a richer understanding of the role(s) of design entrepreneurs. This qualitative approach will explore the gaps and overlaps between the competencies, principles, and skills of design entrepreneurs.

The outcomes of qualitative research can be described as "well-grounded" and represent rich and meaningful data likely to lead to serendipitous findings (Miles and Huberman, 1994). Qualitative studies investigate phenomena in their environment, attempting to decipher the situation regarding the meanings people bring to them (Denzin and Lincoln, 1998). This type of research is concerned with a subjective appraisal, so it means that in this situation, it is dependent on the researcher's understandings and impressions (Kothari, 2004).

Qualitative research is considered as an umbrella term aimed to discover how human beings understand, interpret, experience and produce social realities (Sandelowski, 2004). Qualitative research is a strategy focalised in words rather than quantification of the collected data (Brayman, 2008). This approach explores behaviours, experiences and attitudes to get an in-depth opinion

from participants. The following paragraphs explain a variety of methodologies which belongs to the qualitative approach.

3.4.1 Action research

This approach allows the researcher to collaborate closely to the group of people to improve, develop or to activate in a particular setting. To Bryman (2016), action researchers and participants collaborate to diagnose problems and develop solutions.

3.4.2 Ethnography

The description and interpretation of cultural behaviours taken after participant observation and fieldwork are part of this approach. To Hammersley (2013), this approach utilizes a variety of data sources, with participant observation being at the centre of them. The ethnographer gets involved in the life of the participants, observing them for some time to come up with questions about why they do what they do, the elements involved, discourses and interactions.

3.4.3 Grounded theory

Grounded theorist sees speech as meaningful data, even if this data has not been collected in a natural setting. This allows the researcher to acknowledge documents and secondary research as a useful source of data (Charmaz, 211). Grounded theory is a method to approach qualitative research, focusing on the creation of frameworks and theories based on an inductive analysis of the data. This method prioritises the analysis of the information over the mere description of the phenomena.

Grounded Theory (GT) aims to develop a theory that has emerged from data. The iterative process of data collection generates explanatory ideas that are developed through a systematic selection of cases for subsequent investigation (Hammersley, 2013). To develop a new theory, the researcher does not begin with previous research on the topic, to avoid biases on the subject. This method consists of a systematic approach to inquiry reality by constructing a new theory that emerges from the data. GT explores issues of importance in people's lives, seeking to build a theory coming out of the data collected. (Glaser, 1978; Glaser and Strauss, 1967; Strauss and Corbin, 1998). GT facilitates theory construction over the description of issues, constructing newer concepts over applying established theory, and theorising processes over assuming stable structures (Charmaz, 2006; Charmaz, 2017; Strauss and Corbin, 1998). GT is an interactive method because the researcher interacts with the data and their participants, and then with the

analysis as the researcher develops it. It is iterative because it allows going back and forth between data, analysis, concepts and categories developed (Charmaz; 2017).

The fact that there are some findings along the process of pushing the researcher to explore all possible theoretical explanations makes GT an abductive method as well (Charmaz, 2017). GT offers a conceptual understanding of the studied issue based on data. It provides a structured approach and tools to summarise, synthesise and analyse data. It helps to interpret data by breaking down the data and looking at it closely (Charmaz, 2017b). There are different dominant versions of GT. The classic GT invented by Glaser and Strauss in the late 1960s when quantitative research methods were far more accepted in academia. The Straussian GT was brought up by Strauss and Corbin in the middle of the eighties. Lastly, Constructivist GT was well described by Charmaz at the beginning of 2000s. The standard GT entail a non-committal literature review, due to the potential theoretical contamination that prevents the scholar from creating new categories. However, emerging theory determines the relevance of that literature review prior and during the data collection (Urquhart, 2013; Charmaz, 2008). In GT a thorough study of the context and associated general ideas help the researcher to understand how the theory is constructed, this is called "theoretical sensitivity" (Glaser, 1978; Urquhart, 2013). This theoretical sensitivity includes the level of insight into the research area, and the awareness of the complexity of the issue that the researcher has, and his or her ability to reconstruct meaning from the data generated. This construction of the theory requires the scholar to immerse himself into the context's data. According to Alemu et al. (2015), constructivist grounded theorist agreed that theoretical sensitivity is to approach the problem with an open mind, not with an empty one, contrary to what Glaser (1978) suggested to avoid literature review before collecting data.

Mills (2006) assemble key characteristics of several versions of grounded theory that have common steps:

- Process approach: it studies the process, interactions with the participants, the researcher and the context.
- Memo writing: this tool keeps track on the interviews. It is a way for the researcher to document, storage and organize interesting ideas as he or she goes through the data analysis.

- Theoretical sample: for GT, there is a variety of sources to gather information, such as observations, conversations, public records, journals and diaries, but the primary way to collect information is the interview.
- Constant comparative data analysis: it is process in which the themes or categories emerge from transcriptions, memos and other sources. It allows to compare different groups, people or cohorts, until the data and theory start to settle and few primary categories start to emerge.
- Theory generation: it is the process in which the theory emerges from the data as a result of the analysis made.

Grounded theory leads the research to study the foundation of the process in the field setting and construct an original analysis of it (Charmaz, 2011). In other words, the enquiry needs to start from a general perspective and then expect concepts to gain their way into the analysis. Grounded theory begins as an inductive method, but later on, it involves abductive reasoning, which includes forming and testing the hypothesis (Charmaz, 2011).

To move across data, grounded theorist compare data with codes, codes with categories and categories with other categories. These steps of comparative increment lead to the abstraction of the analysis.

3.4.4 Constructivist Grounded Theory (CGT)

This view of grounded theory recognises that the researcher starts with a broad concept of the subject at the outset of the enquiry and a general frame of questions which evolve as the researcher gains experience of researching the context. This builds confidence in how the researcher begins to make sense of the data. For Charmaz (2006), the research process following a Constructivist Grounded Theory Approach should follow the steps in the following diagram (figure 11).

According to Alemu (2015), the iterative nature of CGT supports an evolutionary process in a non-linear manner. A general model of CGT is below presented based on Alemu (2015). A generic model of the research following the CGT is shown in figure 11, the orange boxes belong to the research design and data collection phase, followed by the green boxes which are part of the coding interview data, and finally the blue boxes, which represents the Theoretical Framework Development.

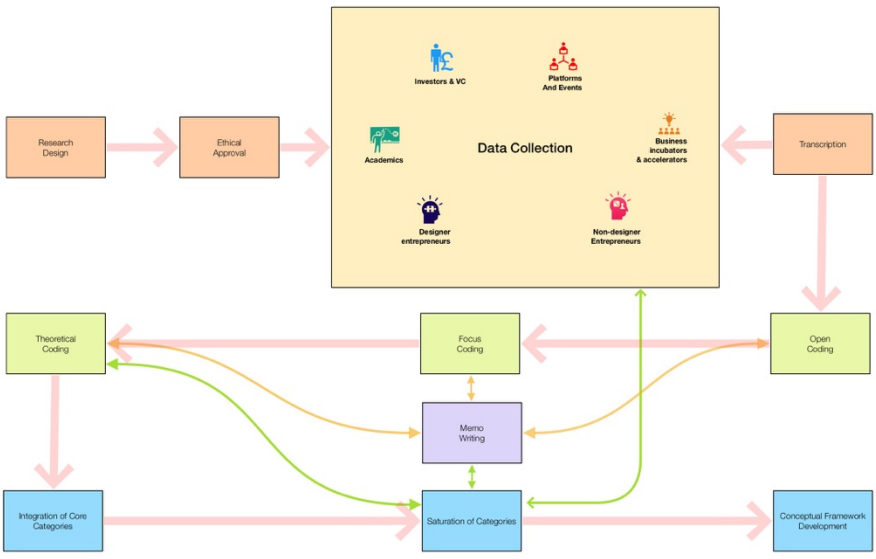


Figure 11. A generic model of de research design of Constructivist Grounded Theory proposed by Alemu (2015).

CG theorists are aware that their standpoints and starting points influence what and how the data is seen in the project (Charmaz, 2008). Specific contexts and situations arise Researcher´s and Participant´s actions and meanings (Charmaz, 2011).

CG theorist considers social, cultural and generational realities in which the experience is located. Therefore, the theoretical understandings are partial, conditional and situated in a spatial, temporal and social location (Charmaz, 2011).

For Constructivist Grounded Theorist, the theory does not emerge from data. Instead, the researcher constructs categories of the data. CGT does not seek out parsimonious explanations and generalizations with no context. Oppositely, constructionist aim for an interpretive understanding of the phenomenon that considers the context. Researcher's views and participants views are an integral part of the analysis and its presentation (Charmaz, 2008).

This study aims to understand an ill-studied issue of Design Entrepreneurship. It is required that the researcher understands the transition that designers go through when setting up their companies. The selected methodology needs to be able to discover this issue, allowing the flexibility to find new threads that might clarify this phenomenon. The Constructivist Grounded Theory works with the data whether or not it has been collected in a natural setting. Statements, actions and key words are of interest in grounded theory. The analysis of the Grounded Theory looks at key word's statements and actions in the data to understand the collective story, which means that the phenomena considers multiple relations the participant has with other members of

the ecosystem. CGT builds its analysis over what is important for the participant, leaning its results and to be pertinent to the community. In CGT the researchers bring their previous expertise and knowledge to the study, this allow the researcher of the study to bring his or her expertise and knowledge to the research and have a proactive role in the shape of the study.

3.5 The selected method for this study: CGT

After revising the available methodologies for qualitative studies, the researcher decided that the ***Constructivist Grounded Theory*** approach would have the **best fit with the demands of this study**. This method was selected because of the iterative ability and flexibility of the research approach. The recognition that the researcher's hermeneutics influence every decision of the process is fresh and honest (Charmaz, 2006). Grounded theory builds-up the theory through a systematic interplay of abductive, deductive and inductive reasoning (Prasad, 2018). The constructivist paradigm, however, considers that the abductive inference as the only way of generating that knowledge (Fisher in Riegler, 2001).

Bergson described ways of knowing an issue "one may either enter into it or go around it" (Bergson, 2007). Constructivist Grounded Theory strives to go inside of the phenomena, whereas a classic grounded theory goes around the phenomena. In CGT, the subjectivity of the researchers is brought to the studied experience, emphasising subjectivity and temporality.

Constructivist Grounded Theory (CGT) preserves the strategies of the standard GT, such as coding, memo writing and theoretical sampling. Alongside, it adds constructivism as a new epistemological foundation. In the CGT, the researcher, the research process and the subject are studied in a socio-cultural interactive context (Charmaz, 2017). This means that CGT is more focused on the context and its complexity. It describes and gives the possibility of multiple meanings and multiple theories, depending on how the theory is constructed and the viewpoint of analysis (Moerman, 2016).

3.5.1 The role of the researcher in CGT

In constructivist grounded theory, the researcher plays a role in the research process as a part of the understanding of the topic. CGT allows the study to analyse the data while the researcher is still gathering it. This is called simultaneous data analysis and collection and helps the researcher to focus on the leads that emerge during the interviews, assessing how relevant those leads are for the research and why they might add to the understanding of the issue (Charmaz, 2017). For

Urquhart (2016, p.1) conducting data collection and running data analysis in parallel is recommended, because *"it helps to build theory using theoretical sampling and 'slices of data' to build out and densify the emerging theory"*.

This constructivist approach to grounded theory is more active. It allows the researcher to start with broad concepts and actively adjust and develop and refine theory, leaving behind the passive stance seen in traditional GT.

Grounded theorists are not committed to the study of the individual; rather, they learn from the stories of people, building the analysis on the studied experience and the collective story (Charmaz, 2011).

3.5.2 The role of Participants in CGT

CGT support the idea of fewer participants when compared to a more quantitative approach, but instead, it favours detail information and intensive interviews.

In this methodology, multiple sources of information are allowed, however, the data obtained from this documents, interviews, field notes and audio-visual recordings should be pondered in terms of relevancy, quality and quantity. During the interviews the information beneath the surface examines earlier events, views and feelings afresh (Charmaz, 2006).

3.5.3 Interaction between the researcher and the participants in CGT

Constructivism accentuates the construction of meaning through the interrelationship between the researcher and the participant (Hayes & Oppenheim, 1997). Researchers bring their values into the research endeavour rather than playing a more passive role as objective observers (Mills et al., 2006).

In this constructivist approach to GT, the interaction between the researcher and the participants cannot be neutral. Mills et al., 2006, argue that *"through active engagements during the interview process ideas are raised, discussed, and knowledge is mutually constructed"*. This is known as data generation.

This interaction between the researcher and the stakeholders allowed ideas to rise and be discussed. The researcher has the opportunity to probe potential areas of insight to reflect their point of view and perspective while allowing the participants to do the same. This constructivist grounded theory approach has been acknowledged by Charmaz (2017) as an appropriate method in areas of discourse where the theoretical foundations are scarce.

3.5.4 Data collection in CGT

CGT toggles between analysis and data collection, enabling the conceptualization of the phenomena. This approach shapes the type of data needed in the study, how to collect it and when to do so. GT uses "tentative theoretical categories to inform subsequent data collection" (Charmaz, 2011). To be able to develop multiple theoretical explanations, grounded theory has to take one extra step, from inductive to abductive reasoning. This reasoning helps to build the most plausible explanation to explain the findings.

Constructivist Grounded Theory utilizes the ***grounded theory rules and treats them as flexible guidelines.*** This allows the researcher to get away from the earlier versions of GT leaned towards the positivistic assumptions (Bryant, 2003) ***allowing multiple realities and the researchers subjectivity into the study.***

3.5.5 Analysis of the data in CGT

To find meaning within qualitative data which is not explicit, researchers use different methods to code the data. In the case of this study, the explanations given for the phenomena are grounded in the interpretivist view of the researcher. This means that the understanding of the phenomena can be achieved by acknowledging a dynamic relationship between the data and the researcher (Greenbank, 2003). Heshusis (1994) suggest that by addressing the concept of interpretation and subjectivity from the start, the study can reduce the distance from the knower to the known, to avoid alienated consciousness or "disenchantment" of knowing.

3.5.6 Coding in CGT

To discover new findings, it is crucial to scrutinise the data systematically. In qualitative studies, it is common that researchers prepare for the analysis by coding the data collected (Blair, 2015). In **Classical Grounded Theory**, coding is an ***inductive*** and ***open-ended process*** rather than a ***preconceived*** and ***deductive one***, as in qualitative research (Wertz et al., 2011). This bottom-up (inductive) analysis allows the researcher to develop and adapt the codes through the coding process (Maguire & Delahunt, 2017). Classical Grounded Theory encourages the researcher to not contaminate the data with preconceived ideas. This means the literature review should not be done before the data is collected. However, in the **Constructivist Grounded Theory**, as explained by Hallber (2006) and Charmaz (In Denzin & Lincoln, 2000) the researcher cannot avoid ***conducting the literature review before the data is collected***. Bryant and Charmaz

(2008) noted the relevance of understanding the discourse around the research area of knowledge. Charmaz (2006) claimed that the literature review enables researchers to situate themselves and their study "within the body of related literature" (Bryant & Charmaz, 2007, p.166). In this study, the typology presented in chapter 2.6.1 served as a starting point to make sense of where the researcher was standing. It was used as ***a priori coding*** to classify whether the data collected belonged to the entrepreneurial decisions or product design decisions.

Stemler (2001) shows the difference between ***emergent coding*** (also known as initial coding and formerly as an open coding) and ***a priori coding***. The first one happens when the codes are drawn from the data, and the second one happens when codes are created beforehand and applied to the data.

Charmaz (2006 pp.43) stated that "coding means naming segments of data with a label that simultaneously categorises, summarises and accounts for each piece of data". This grouping of the data speaks for the researcher´s criteria to select, separate, and sort data to begin the analytic stage (Charmaz, 2006). These codes emerged from the interaction between the data and the researcher.

Blair (2015) recognised that any coding is subjective, and the validity of the result depends on the hermeneutics of the researcher because the researcher interprets the findings according to his or her position. The researcher has to acknowledge that his or her particular perspective is likely to influence his coding method; however, in qualitative data analysis, ***this bias is not meant to be corrected.*** Instead, ***it is beneficial*** that the analyst can use their unique skills, talent and expertise, the validity of it becomes a question of hermeneutics (Blair, 2015).

3.5.7 Manual coding or computer coding

The process of coding is not a mechanical task. It is an inductive process where intuition and creativity play a significant role (Basit, 2003). Saldaña (2016) pointed out that ***manual coding*** is particularly beneficial for the researcher if he needs to have greater control and ownership of the analysis, usually applied in smaller-scale studies. Dey (1993) and Basit (2003) have discussed the downsides of manual coding, claiming that it can be a frustrating process and be slow and tentative. ***Computer coding***, by contrast, is fast but requires learning the skills to manipulate the software and a considerable amount of time timeline of the project. Alemu et al. (2015) suggest that the use of software increases the efficiency and enables the organisation of data, facilitating the different stages of analysis, memo writings and the integration of supportive data. Basit (2003) mentions that this process is smooth and facilitates building reports from the

data. However, computer coding is not considered convenient when the study consists of only a few interviews. *Computer coding does not code the data automatically*. It requires the researcher to code line by line, creates themes (nested nodes) and contains them into categories (nodes) as in the manual coding. The computer coding helps the researcher to incorporate multiple files and have overarching themes and categories of the whole set of interviews and supporting data available (secondary research).

Robson (2002) summarised the advantages and disadvantages of using a computer program to analyse the data.

Advantages:

- It is an organized single location for all stored material.
- The access to material is easy
- It can handle large amounts of data

Disadvantages:

- Proficiency in the usage of the software takes time
- Changes in the code might take time
- Particular programs tend to impose specific approaches to data analysis

3.5.8 Different stages of Coding in CGT

Glaser (2001) stated that the primary purpose of coding is to abstract information that goes beyond descriptions from the data and instead focus on conceptualizing themes valuable to investigate the phenomenon.

Codes can be categorized into two types of codes, as Saldaña (p.p. 55, 2016) pointed out:

> *"First cycle methods are coding processes for the beginning stages of data analysis that split the data into individually coded segments. Second cycle methods are coding processes for the later stages of data analysis that compare, reorganize or focus the codes into categories, prioritize them to develop axis categories to formulate a central category that becomes the foundation for the explication of grounded theory".*

Emergent coding splits the qualitative data into smaller pieces that can be carefully examined and compared. It aims to find similarities and differences that lead the research into any possible theoretical direction (Strauss & Corbin, 1998). Focus coding seeks for the most common codes to produce categories that make the most logical sense (Charmaz, 2014).

Theoretical coding functions as an umbrella term that covers codes and categories developed in a grounded theory study. It focuses on the primary term of the research or the core category. This primary term condensed in a few words what is the central topic of the research (Strauss & Corbin, 1998).

In the constructivist research paradigms, the researchers and their own value system are recognised as an integral part to the research process, focusing more on the authenticity with which the researcher allows the data to speak, and less on the degree of agreement among multiple qualitative coders (Lincoln and Guba, 1986; Nili and Tate, 2017) referred as an inter-rater reliability test.

3.5.9 Theoretical sampling and theoretical saturation

Theoretical sampling determines where the researcher needs to direct the study. Theoretical saturation is reached when no new properties or categories emerge from the data (Charmaz, 2006; Alemu, 2015). When the incorporation of new data adds no new insights to the study, it is said that theoretical saturation has been achieved. Charmaz (2006) recognizes that theoretical saturation is a subjective exercise due to the nature of the interpretative approach. She acknowledges the importance and limitations of this subjectivity.

3.6 Trustworthiness in Grounded Theory

For Charmaz (2016) grounded theory can coexist with a constructivist approach where the information is co-constructed as a result of the interaction between the interviewer and the respondent, both data and analysis are created from shared experiences and relationships with participants. CGT is an interpretative method, focused on the study of how and why participants construct meanings and actions in specific situations (Charmaz, 2006). The researcher is a co-constructor of meaning, in other words, the meaning is not objectively pulled out from people, and rather it is co-constructed in interaction (Moerman, 2016). The constructivist paradigm aims for the authenticity of the study rather than measuring the agreement between multiple coders (Nili et al., 2017).

Every qualitative study needs to provide evidence of the reliability, internal and external validity of the study. These elements constitute the trustworthiness of the study. In GT, the research can be evaluated pondering the credibility, transferability, dependability and confirmability of the study (Sikolia et al., 2013).

3.6.1 Credibility – Internal Validity

Internal validity refers to how congruent the findings are with reality (Merriam, 1998). In table 5 some methods to attain the internal validity have been integrated from the literature (Sikolia et al, 2013; Brown et al., 2002, Shenton, 2004).

Table 5 Methods to attain internal validity based in Sikolia et al., (2013.

Dimension	Element	
Credibility	Internal validity	a) Prolonged engagement with participants(Brown et al. 2002; Jacelon and O'Dell 2005; Morrow 2005) b) Triangulation of data (data from interviews, observations, documents etc.)(Bowen 2009; Brown et al. 2002; Jacelon and O'Dell 2005) c) Thick descriptions of data and sufficiency of data assessment or saturation(Morrow 2005) d) Respondent validation of interview transcripts and emerging concepts and categories (participant checks) (Brown et al. 2002; Jacelon and O'Dell 2005; Morrow 2005) e) Participant guidance of inquiry (theoretical sampling)(Cooney 2010) Use of participant words in the emerging theory(Cooney 2010) f) Negative case analysis(Brown et al. 2002; Morrow 2005) Peer debriefers(Brown et al. 2002; Jacelon and O'Dell 2005; Morrow 2005)

3.6.2 Triangulation

There are multiple kinds of triangulation to assist internal validity of the study, such as multiple data collection methods, multiple data sources, multiple investigators or multiple theories (Merriam and Tisdell, 2016, p.245). The method triangulation includes observations, field notes and interviews (Polit & Beck, 2012). The triangulation of investigators refers to two or more researchers involved in the same study, to provide multiple observations and conclusions. This method delivers a confirmation of the findings (Carter et al., 2014; Denzin, 1978). The last kind of triangulation uses different theories to analyse the data (Carter et al., 2014). These multiple perspectives assist the study in supporting or refuting the findings.

3.6.3 Transferability - External validity

Authors in qualitative studies support the idea that external validity of a study can be achieved by providing thick descriptions of the research (Sikolia, 2013; Cooney, 2010). The methodology of the study, the interpretation of the results and the emerging theory also support the external validation of the study (Shenton, 2004).

3.6.4 Dependability

The positivist paradigm aims attention at the use of techniques to prove that the results obtained from the study could be obtained again given the similar techniques, the same context, and the same participants (Charmaz, 2014). In a positivist study:

> *Reliability is the extent to which a variable or set of variables is consistent with what it is supposed to measure when repeated multiple times* (Straub, 2004; pp.400-4001).

However, inductive-qualitative researchers find this assertion problematic in their field (Marshal and Roseman, 1999). In the eyes of Morrow (2005) and Sikolia (2013) dependability is a concept that is analogous to reliability. Still, dependability requires the confirmation that the data is consistent across time, across researchers and analysis techniques. An external researcher can be involved to audit the way the researcher conducted the study, and if they acted following the GT method. This external researcher can examine the research process to determine the reliability of the findings.

Shenton (2003 pp. 9) summarizes the steps to secure the dependability of the study as follows:

> *a) The research design and its implementation, describing what was planned and executed on a strategic level*
>
> *b) The operational detail of data gathering, addressing the minutiae of what was done in the field*
>
> *c) Reflective appraisal of the project, evaluating the effectiveness of the process of inquiry undertaken.*

To Sikolia (2013), the use of overlapping methods in the study helped to demonstrate the ties between credibility and dependability. As stated in the method triangulation, the overlapping methods used in the Phase Two data collection addressed the dependability of the study directly, enabling the researcher to potentially repeat the study but not automatically getting the same results. An Inquiry audit and a step by step replication are methods for establishing dependability of the study (Guba and Lincoln, 1985). Step by step replication relies on the fact that

more researchers can participate by studying the same context independently. However, as Gribbin (2018) explained, for early researchers who frequently are the only principal investigators and whose budgets do not permit the hiring of external investigators, this method is difficult to follow in the timeframe and budget given for the study.

To establish credibility on the study, an external auditor is invited to evaluate the theoretical foundations of the study, the methodology and the analytical choices made by the researcher; this is called an inquiry audit (Carcary, 2009). As Hoepfl stated in his study:

> *"An inquiry audit is a post-investigation audit that can be utilised to examine the process and product of research in order to ensure consistency across the analysis process" (Hoepfl, 1997 in Gribbin 2018 pp 96).*

In CGT, the researcher's need to prepare themselves before interacting with the participant, opposite to the previous version of GT that relies on avoiding previous information so as not to have assumptions at the beginning of the process and in avoiding interacting with the participant.

The dependability of the study requires a set of procedures performed by the researcher including inquiry audit, stepwise replication, a code-recode strategy, triangulation and peer examination (Ary et al., 2010; Chilisa & Preece, 2005; Krefting, 1991; Schwandt et al., 2007 in Anney, 2014).

An audit trail is a post-investigation audit that can be used to analyse the consistency across the analysis of the study. It has been proven in recent studies that this method can be used to ensure the dependability of the coding and analysis process (Gribbin, 2018).

The stepwise replication procedure requires two or more researchers to analyse the same data separately and compare the results (Chilisa & Preece, 2005).

The code-recode strategy requires the researcher to code the same dataset twice, with the time between the two coding processes and compare both codings. Anney (2014) called this time-gap a gestation period.

The peer examination requires the researcher to discuss their process and their findings with neutral colleagues doing qualitative research (Anney, 2014).

3.7 Theory emerged from the study

The word theory refers to the system of ideas that intend to explain a phenomenon. It is a formal statement where ideas explain facts or events (Cambridge, 2019). However, depending on

the philosophical stand, the word theory changes its definition. For the positivist philosophy, a theory is a "statement that covers a wide range of observations" Saldaña, 2016, hypothesised that this theory has to be "accurate, replicable and empirical". In the interpretative philosophy, a theory is meant to support the understanding of phenomena, rather than providing an explanation for it. It is considered abstract and interpretative and relies on theorist reasoning (Saldaña, 2016). In the constructivist grounded theory, the resulting theory is an interpretation and recognises that it depends on the researcher and his or her understanding (Charmaz, in Denzin and Lincoln, 2000). Glaser (1992) established that a theory could be coded in different ways, as long as it resolves the primary concern.

The theory has to teach the fundamentals and the abstractions of the experience and poses new questions about it, Saldaña, (2016) explained that theorising fosters "seeing possibilities, establishing connections and asking questions". To be able to build a theory, abductive reasoning is needed. Abduction a form of reasoning that generates and evaluates hypotheses in order to make sense of puzzling facts. Abductive reasoning fits complex situations and may address many of the challenges of complexity (Dunne and Dougherty, 2016). The interaction between the inductive and abductive reasoning is needed to build up the theory.

3.7.1 Techniques and procedures

3.7.1.1 Observational methods

There is a basic classification on the observational methods:

- Naturalistic observation: this refers to observing behaviours in the context. It has to occur without any intervention and without awareness of the ones observed. The behaviour has to occur naturally.
- Participant observation: It is considered when the person or people knows that their behaviour is being recorded and there is some sort of manipulation of the context.
- Laboratory observation: This is when the participants are observed and are aware that they are being recorded, but they are not in their context.

3.7.1.2 Questionnaires

With these techniques there is a set of questions to collect information from a group of people. It allows to get access to people's thoughts and feelings.

There are close and open questions,

3.7.1.3 Open questions

Open questions allow the participants to express freely and usually the data collected from here is qualitative.

3.7.1.4 Closed questions

In the case of closed questions, the participant is asked to answers specifically and usually within a range of possibilities given by the researcher. Most of the data collected here can be easily transformed into quantitative data.

3.7.1.5 Likert scale

This kind of questionnaire can be both Qualitative and Quantitative. This scale helps the participant to express the degree of preference or agreement or disagreement from each particular question. They have a range of words where the interviewee can choose from.

3.7.1.6 Interviews

There are three different types of interviews:

3.7.1.7 Structured Interviews

There is a predetermined set of questions that the researcher will read through in a fixed order.

3.7.1.8 Open-ended interview

It can be considered as a discussion, where the interviewer can ask for more details and elaborate whenever the researcher thinks more information will help to enrich the understanding.

3.7.1.9 Semi-structured interview

It is a mixture of the previous types. It starts with a list of questions and themes to explore, set out in advance but the interviewers can expand and enrich the questions when they consider pertinent.

3.7.2 Sampling

Before any data is collected, a definite plan must be determined to obtain a sample from a given population (Rajasekar et al., 2006). The sample design refers to the technique or the procedure that the researcher would adopt in selecting the elements for the sample (Kothari, 2004).

There are different considerations about some of the reasons behind the sampling research methods; these can be used to reduce resources such as time and money or to enable more accurate measurements or if the total number of members is unknown.

To determine the sample design, there are points to consider:

- The type of universe, referring to whether or not the numbers of items are certain or infinite.

- The sampling unit determines geographical, social or personal characteristics of the sample.
- The sample size refers to the number of items to constitute a sample taken from a universe.
- The parameters of interest are the characteristics of the population this research is interested in.

3.7.2.1 Snowball sampling:

Non- probability samples ensure that the sample chosen will enable to gain understandings and insights (Patton, 2002) and provide justifications. This is imperative for exploratory research where the aim is to collect new insights into phenomena or for the phenomena and for the studies that require the development of rich understandings upon which theoretical generalisations may be based on (Saunders, 2012).

3.8 Visual summary of the research methods

Figure 12 shows the diagram developed by Sanders (2007) and the selected research path for this study.

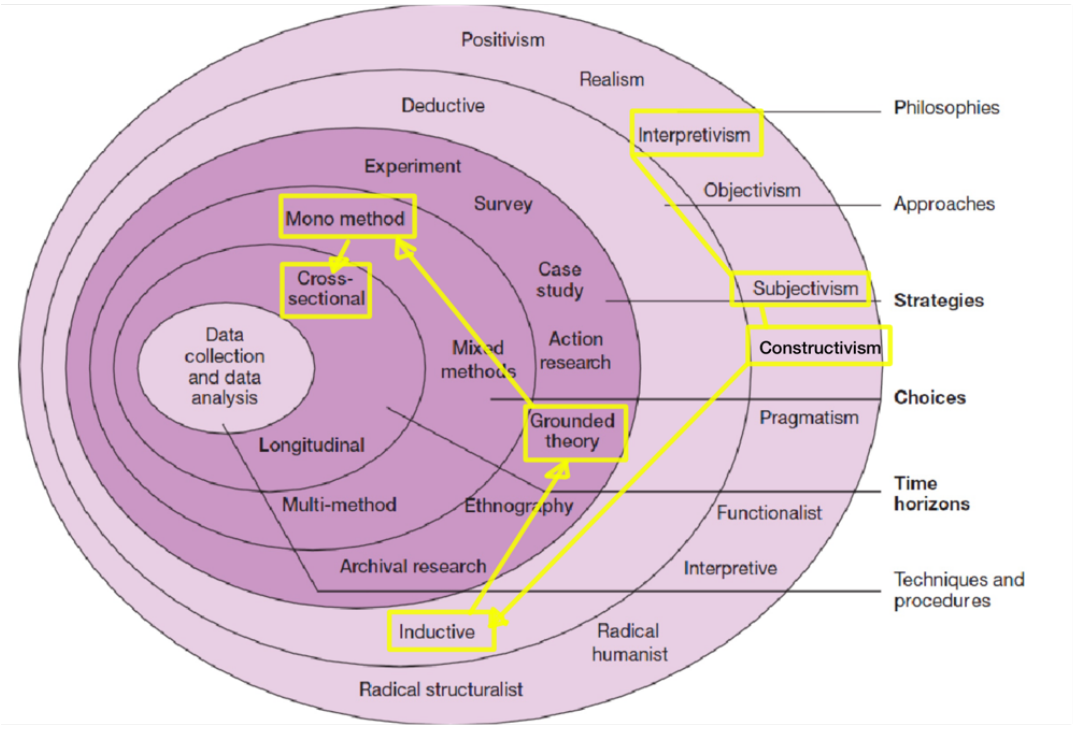


Figure 12. Summary of the research methodology selected for this study based in Sanders (2007).

3.9 Research Design

For this study, the research design provided a conceptual structure of the conducted research. The purpose of this stage is to create a plan to collect consistent and significant information considering the resources available. According to Kothari (2004), different purposes can be categorised into four different groups as follows: Exploration, Description, Diagnosis and Experimentation. Depending on the intended plan of the study, the type of research purpose category is followed. The study is divided into six stages, excluding the literature review. It goes from research design, data collection, analysis, iterations, synthesis and conclusions.

Exploratory studies provide the clarification of an ill-defined problem, providing an understanding of the nature of the problem (Manerikar & Manerikar, 2014). One of the principal reasons for this type of study is to test a concept, helping in clearing connotations and definitions of the study. For this study, the selected methods were bibliographical research, semi-structured interviews, in-depth interviews and case studies. In the case of a descriptive study, according to Dulock, 1993, the purpose is to characterise the facts and typical features of a given group of people, individual or area of interest.

This description determines what exist, the frequency with which something occurs and group the information. These studies document the situation to discover hidden associations among the variables, participants or environments.

For the diagnostic study, the evaluation of a particular test discriminates the presence or/and the absence of one specific factor in circumstance or event in question (Moons, 1996).

In the experimental study, the researcher is enabled to test hypotheses proving credible relationships between the dependent and independent variables. According to Beaumont (Beaumont, 2009), this type of study serves the researchers with the best way to investigate causality due to the high degree of control. The way in which designers' transit from the disciplinary approach of product development to the way they set up a business in a product-based start-up is still an ill-defined problem. The actual references come from other areas of entrepreneurial studies. Having said that, the nature of this study is exploratory.

This study follows the Constructivist Grounded Theory proposed by Charmaz (2006), where she claims that CGT uses new insights, emergent questions and further information to simultaneously construct the method of analysis, as well as the analysis. Sanders mentions "No set of rules can dictate what a researcher needs to do and when he or she needs to do it" (1995, pp.90).

Charmaz summarizes this as "*Treat the research process itself as a social construction*" (2006, pp. 403). To be able to do this, the researcher needs to be part of the study. He does not have to stand outside of it. For Charmaz, reflexivity is central to this constructionist revision and renewal of grounded theory. Another principle is that for a 21st century social constructionist, grounded theory has to ***"Improvise methodological and analytic strategies throughout the research process"*** *(Charmaz, 2006, pp. 403).*

3.9.1.1 The literature Review:

The constructivist approach of grounded theory allows the researcher to come ***"open-minded but not empty-minded"*** (Charmaz, 2006). Therefore, the literature review was the first step this research took. Charmaz's version of constructivist grounded theory shares this position. It ***encourages the researcher to do research beforehand*** and ***be flexible in the data collection*** model (asking questions out of the script and bringing on the spot reflections to the chat).

Chapter 1 discusses contemporary theories of Design Entrepreneurship from the literature and outlines these in a relational framework which concludes that chapter. It summarizes the researcher's expectations and starting position when embarking on the first phase of data collection.

CGT encourage the previous exposure of the researcher to the available literature, and the use of theoretical frameworks, contrary to the conventional GT principles of avoiding the exposure of literature and the use of conceptual models or frameworks. A conceptual framework helps to guide the development of research for novice researchers (Nagel et al., 2015).

3.9.1.2 Determining the sample

Due to the emerging nature of the design-based entrepreneurship, it is hard to find plenty of cases for the study. Teachings can be learned from the current start-ups founded by designers.

The constraints on budget and hard-to-access organisations direct the effort of this study to follow the criteria below for the participants in the studies in this research: Start-ups with designers at a senior level and founders with a background in design.

To contrast this study and stress the differences between designers and Non-Designer Entrepreneurs, a sample of entrepreneurs and start-ups with no design background will be analysed.

The stakeholders around Designer Entrepreneurs for this study are considered part of the "Entrepreneurial ecosystem", and data from their interviews will guide the development of the

final interview model to be used with Designer Entrepreneurs. This close up with the stakeholders is expected to have the side benefit of helping the researcher to identify and access additional actors in the ecosystem, including access to more Designer Entrepreneurs (snowball sampling).

3.9.1.3 Sampling approach for Phases 1 and 2

In this study, the objective of Phase 1 was to explore the supporting environment for entrepreneurs and start-up organisations, including Designer Entrepreneurs and non-designer entrepreneurs. A purposeful sampling and snowball sampling were used in combination; purposeful sampling at first, using initial lists of organisations known to be significant to entrepreneurs such as investors, and ongoing snowball sampling to identify a wider sample of stakeholders, influencers, commentators and entrepreneurs.

For Phase One, the members of the entrepreneurial ecosystem were invited to participate as long as they were working among tangible product start-ups, and they have direct experience with new product development or entrepreneurship.

3.9.1.4 Sample criteria summary: Phase One

Participants: Members of the entrepreneurial ecosystem involved in new product development and start-ups focused on hardware.

Sampling technique: Purposeful sampling leading into snowball sampling

Location: International

Industry: Consumer products (tangible products, non-perishables)

Stage of development: N/A

For Phase Two, purposeful sampling was used to select a shortlist of individual Designer Entrepreneurs who meet the criteria.

3.9.1.5 Sample criteria summary: Phase Two

- Founder: Designer Entrepreneur
- Sampling technique: Purposeful sampling
- Location: United Kingdom (preferable)
- Industry: Consumer products (tangible products, non-perishables)
- Stage of development: at least one product has made it to the market place.
- The sophistication of the company: Design is used not only to give shape to the product but also to understand, explore and deliver value under uncertainty.

3.9.1.6 Research Techniques for data collection

Before each interview, the researcher compiled all the bibliographical data from the participant; multimedia materials and archival records available on the web to enrich the enquiry. For Phase One, the selected research techniques were:

- A questionnaire

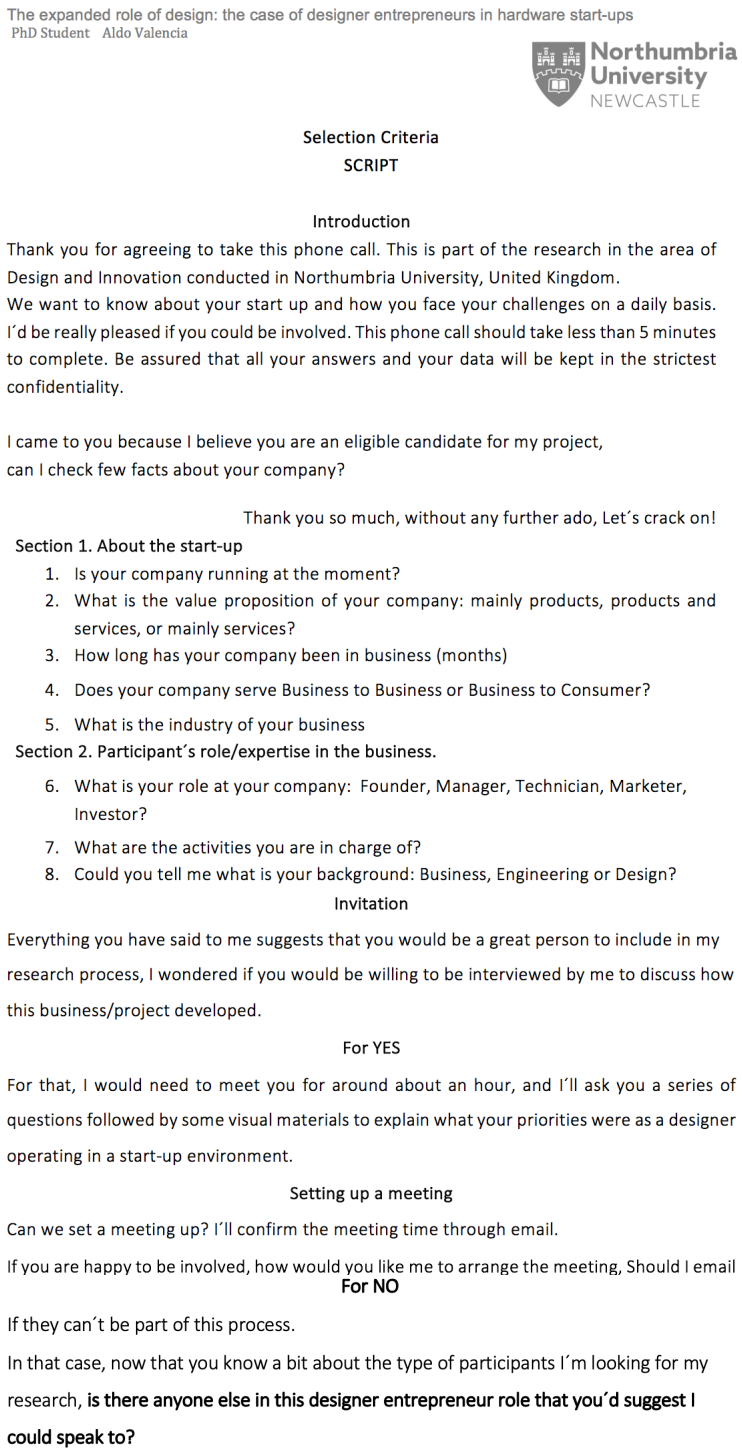
To determine whether they qualify to be part of the study or not.

- A semi-structured interview.

Before the interviews, the researcher gathered all the relevant information about the participant, and from there, the interview was developed. The researcher also used as a guide to the doodle map of the literature review.

- Imagery in the form of mind maps of concepts, to pick up on participant´s ideas and how they understood specific topics related to entrepreneurship and design.

A sample of the questionnaire to outline the characteristics of the potential participant is shown below.



The expanded role of design: the case of designer entrepreneurs in hardware start-ups
PhD Student Aldo Valencia

Northumbria University NEWCASTLE

Selection Criteria
SCRIPT

Introduction

Thank you for agreeing to take this phone call. This is part of the research in the area of Design and Innovation conducted in Northumbria University, United Kingdom.
We want to know about your start up and how you face your challenges on a daily basis. I´d be really pleased if you could be involved. This phone call should take less than 5 minutes to complete. Be assured that all your answers and your data will be kept in the strictest confidentiality.

I came to you because I believe you are an eligible candidate for my project,
can I check few facts about your company?

Thank you so much, without any further ado, Let´s crack on!

Section 1. About the start-up

1. Is your company running at the moment?
2. What is the value proposition of your company: mainly products, products and services, or mainly services?
3. How long has your company been in business (months)
4. Does your company serve Business to Business or Business to Consumer?
5. What is the industry of your business

Section 2. Participant´s role/expertise in the business.

6. What is your role at your company: Founder, Manager, Technician, Marketer, Investor?
7. What are the activities you are in charge of?
8. Could you tell me what is your background: Business, Engineering or Design?

Invitation

Everything you have said to me suggests that you would be a great person to include in my research process, I wondered if you would be willing to be interviewed by me to discuss how this business/project developed.

For YES

For that, I would need to meet you for around about an hour, and I´ll ask you a series of questions followed by some visual materials to explain what your priorities were as a designer operating in a start-up environment.

Setting up a meeting

Can we set a meeting up? I´ll confirm the meeting time through email.

If you are happy to be involved, how would you like me to arrange the meeting, Should I email

For NO

If they can´t be part of this process.

In that case, now that you know a bit about the type of participants I´m looking for my research, **is there anyone else in this designer entrepreneur role that you´d suggest I could speak to?**

Figure 13. Sample of the questionnaire utilized to select the participants.

Figure 13 shows the questionnaire delivered through e-mail. Once they qualified to be part of the study, a semi-structured interview supported by visual aids (Annex B) was submitted to support the enquiry.

All the interviews were recorded and then transcribed in a word processor. Before each interview, the researcher created a file where all the information available was compiled (figure 14). This was used as a guide during the interview and to avoid asking repetitive questions that could be answered using information already in the public domain and sanctioned by the interviewee. For example, in promotional content published online by their own business, or from trusted secondary research sources.

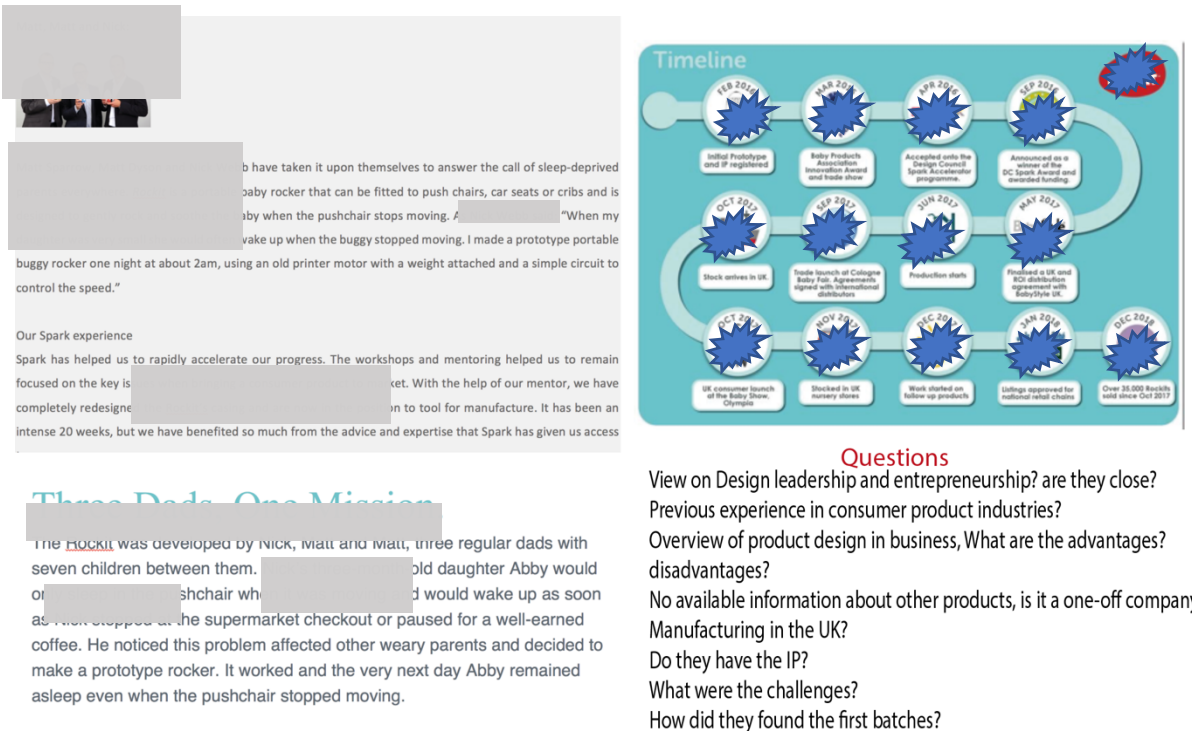


Figure 14. Example of the Files created before each interview. Sensitive information about the identity of the DE have been covered to attain anonymity.

3.9.1.7 Phase Two research techniques

For Phase Two, the selected research techniques are a semi-structured interview (Annex B) followed by a set of visual activities. The data collection method will be an interview model comprising a semi-structured interview and visual tools such as a) Map of the milestones and b) Map of the reasons why start-ups fail. The imagery produced will be used to prompt discussion. During the use of these visual aids, the participant will be asked to use a think-aloud approach. The interviews will be audio or video recorded, depending on the level of permission attained at the outset Interview and conversing (Semi-structured Interview).

Since the information pretended will be collected through a retrospective study, entrepreneurs that have customers demanding the product or the ones that have tested their product with a real client are the target. By doing so, the information collected will lead to finding patterns, causalities, and relations among them having as a common ground that their product is accepted by a market.

3.9.1.8 Coding the data:

Phase One data collection explored the Design Entrepreneurship issue from multiple perspectives. It **considered various elements** of the ecosystem such as *Academics Experts, Non-Designer Entrepreneurs, Funding Platforms, Investors, Business Incubators & Accelerators and Designer Entrepreneurs.* By doing so, the image of the Designer Entrepreneur in this study is more rounded and ***considers the ecosystem*** in which the designer has to set up their companies. The coding process needed to be open to new themes and categories, to allow the researcher to find new threads to explore to describe a more in-depth picture of the entrepreneur. The rationale behind this phase was to discover new perspectives or gaps in the knowledge that the literature review might have missed.

The memo writing and the use of the map of doodles help the researcher to have a constant analysis process. Each interview gathered new insights and expanded the understanding of the context and the details behind the subject and the members of the ecosystem. It was essential for the study to understand the background and the context of design entrepreneurs before digging deeper into the main focus of the research.

However, in order to reduce the amount of information and facilitate the researcher's job, for Phase One specifically, the researcher relied on memos and notes to select the parts he believes are pertinent to the study. Annexe D shows the extended list of insights found in Phase One data collection.

Phase Two data collection utilized ***two types*** of coding. The first one is an ***emergent coding*** method, to allow Designer Entrepreneurs unveil their characteristics and their processes in-depth and the second one is a ***priori coding*** (template coding), which is based on the typology presented in chapter 2.6.1 as a way to extract meaning from the data (Blair, 2015). In this analysis, the researchers' impressions and interpretations are build up from the "spoken word", consistency, contradictions, frequency and intensity of comments, and context, therefore the information needs to be reduced to facilitate the researcher to make sense of it (Celano, 2014).

3.9.2 Analysis

In ***Phase One*** data collection, after the interviews have been transcribed, the code analysis consisted of: firstly, cleaning of the data and compiling the collected information, sorting them according to date, profile and industry and secondly, disassemble the data into smaller fragments and finally, integrate the data into substantive themes or codes. That is, reorganising the pieces into different groupings and sequences (the software NVivo v.12 has been used in phase).

The fourth step involves using the reassembled material to create a new narrative (interpreting), connecting the different stands from each discipline (Business and Design) and finding patterns from the original stories.

In ***Phase Two*** data collection, the information obtained from Designer Entrepreneurs is transcribed, cleaned, compiled and sorted by cases. Next, the data is disassembled into smaller fragments, and on the third step, the fragments are integrated into substantive themes or codes.

The fourth step involves **emergent coding**, **focused coding** and **template coding**. First, the ***template coding*** allowed the researcher to compare the typology developed in Chapter 2.6.1 with the data collected. By doing so, the study strengthens the categories identified in the literature. However, the researcher was aware that new findings were waiting in the text. Therefore, the ***emergent coding*** was conducted in Phase Two data collection. This favoured the discovery of new insights and threads that had not been considered in previous theories nor the framework developed by the study. The ***focused coding*** sought after the most frequent and relevant codes for the study. The description of the characteristic of each category and how they relate to each other was instrumental for further stages in the analysis process.

External researchers will be required to test the codes and narratives emerging from this study to avoid biased interpretations in this phase. For the findings and discussions, experts from the design and business disciplines related to the new theories of entrepreneurship or design management will look at the narratives and findings and will provide feedback.

3.9.2.1 Tools for coding

In Chapter 2.9.7, the differences between manual and computer coding were explained. Based on that information, the researcher had to decide whether to use a manual coding or a computer coding tool. In ***Phase One data*** collection, the number of interviews is considerable, making the ***computer coding*** the option to go due to its practicality of handling large amounts of information.

In **Phase Two** data collection, the selected tool to code the data was ***manual coding***. This coding allowed the researcher to revise the seven cases more intimately and kept rearranging the themes and codes.

3.9.2.2 NVivo

NVivo is a tool developed to help social scientist analyse qualitatively the information collected. Hoover and Koerber (2011) claim that out of all the software available for qualitative analysis, NVivo provides the best balance between ease of use and power. All the aspects needed in constructivist grounded theory can be done with this package such as emergent coding, theoretical coding, and analysis of data, theoretical development and presentation of findings (Hutchison et al., 2010).

3.9.3 Trustworthiness in Grounded Theory

To maintain the sense of ***trustworthiness*** in the study, the researcher gathered evidence of ***internal validation***, ***external validation***, ***credibility*** and ***dependability*** as explained in Chapter 3.2.2. Chapter 10 shows evidence supporting the trustworthiness of the study.

To perform an ***audit trail*** on the study, this research had a procedure called "mock-Viva" performed by internal members of the staff at Northumbria University. They have access to the raw data, memos, and evidence to track back any decision made by the researcher. To secure a ***code-recode strategy***, the researcher conducted two coding processes, separated in time to allow the "***gestation period***" and then compare the results. This activity was carried out using a small sample of data. To secure a ***step-wise*** replication, the researcher asked four researchers to analyse the same data, expecting that any discrepancy between the data and the codes will be pointed out by the researchers. For the ***peer examination***, the researcher has actively participated in seminars and present his work among qualitative researchers, to receive feedback about the process and findings of the study. He received an international award for his essay "Insights about the way designer entrepreneurs manage start-ups" from the Design Management Institute in the USA.

In conformity to Birt et al. (2016) and Gribbin (2018), a set of questions were made at the end of the scrutiny for each element. Figure 15 shows an excerpt of the questionnaire.

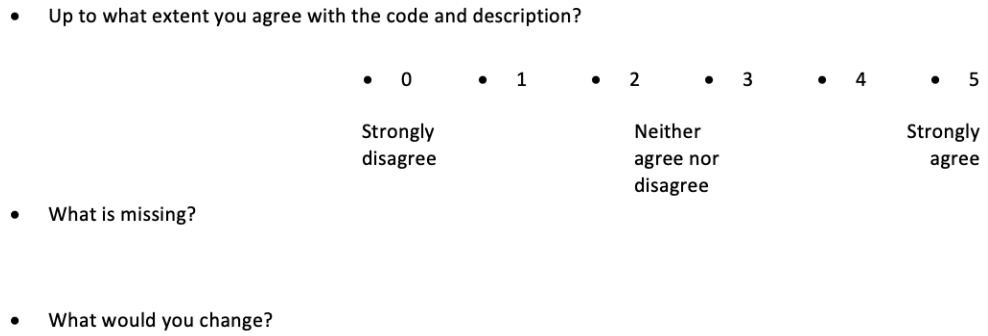


Figure 15. Questions asked in the Inquiry Audit.

The results of the audit inquiry are presented in the Discussion section of the thesis (chapter 5.13), along with existent theories relevant to the topic and the analysis of the researcher. The ***audit inquiry*** shed some light onto the way the transcripts have been coded thus expanding to new potential leads for further studies.

3.9.4 Summary of the stages of the research study

Table 6. The stages of the study are shown below.

Stages of the research					
Lit review **Stage 0**	***Data collection*** **Stage 1** Phase One and 2	***Coding and Analysis*** **Stage 2**	***Findings and Discussions*** **Stage 3**	***Contributions and conclusions*** **Stage 4**	***Trustworthiness of the study*** **Stage 5**

3.10 Development of the visual aids

This chapter covers the development of the visual aids for Phase One and two. It is worth noticing that they happened in a different sequence. The visual aids developed for Phase One data collection were designed to explore the context and try to answer the question left after the literature review stage. The researcher used these visual aids to run the inquiry with the entrepreneurial ecosystem. After collecting the data from Phase One, the second set of visual aids were developed for Phase Two data collection.

It is worth noting that this chapter reports the development of the visual aids that supported the enquiry in Phase One data collection and the ones included in the final interview model for Phase Two data collection. It does not communicate the insights from Phase One data collection,

as the next chapter will expand more in the insights collected from each participant. In this chapter, the development of the visual aids in a sequence is discussed.

3.10.1 Visual aids for Phase One data collection

3.10.1.1 Visual approach

In parallel of the development of the Design Entrepreneurship for Consumer Product Innovation typology, the researcher documented the main ideas of the literature review in the form of imagery (mind maps, doodles, diagrams) that later on would be used as a prompt in the early stage interviews.

The first imagery produced was a mind map (figure 16) which supported the sense of making the process of the vast amount of theory collected, showing the connections between the concepts and the nodes formed. Later, as soon as the complexity of the information arose, a map developed by doodles (figure 17) represented the key ideas that contribute to the comprehension of the issue. The process of drawing these doodles helped the scholar to reflect on the theory and find a way to synthesise most concisely the concept.

Down the line, this map was used by the scholar to drive the conversation with the interviewees. It was not a premise that this imagery would support and enable the elements of the ecosystem to express beyond words and fixed answers their experiences and their knowledge. Still, it turned out to be a very effective way to engage with the interviewees and based on their feedback, to discover and unfold their story and their gained knowledge.

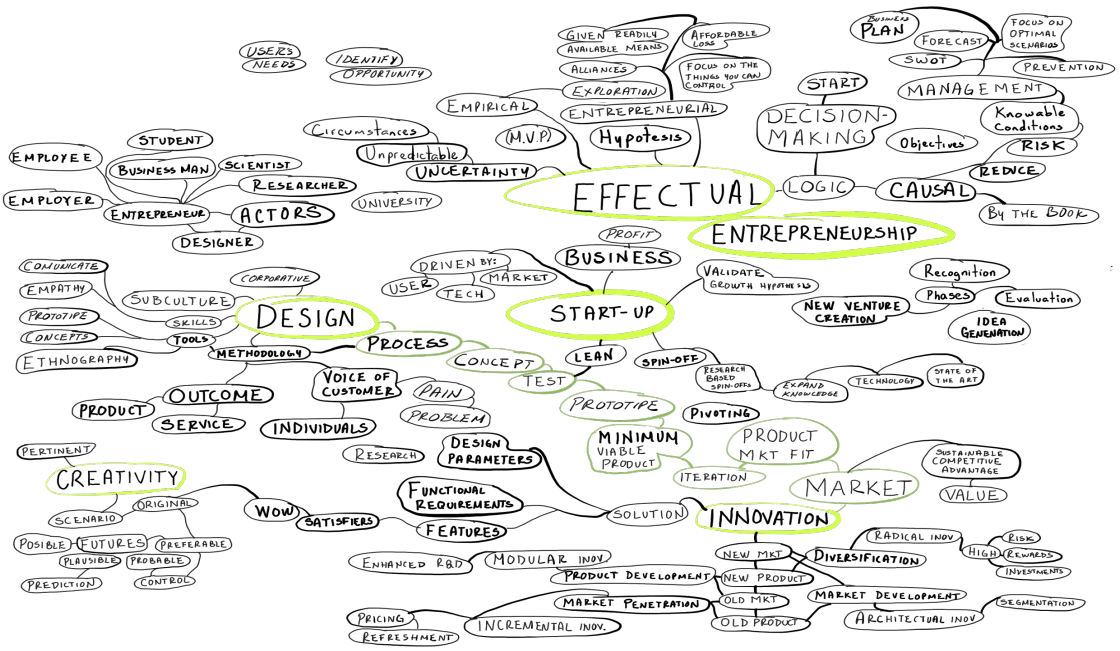


Figure 16. Visual summary of the literature review. Mental map of potential gaps in the knowledge.

3.10.1.2 The visual summary: How to maximise the time given?

The participants of the study had limited time to participate in the study. Thus, the researcher had to use the time given in the most effective way possible. A line connecting the ideas were drawn, and the sequence of images shown to the stakeholders. This sequence followed a narrative from the big picture of the issue into the details and specific questions or unsolved issues.

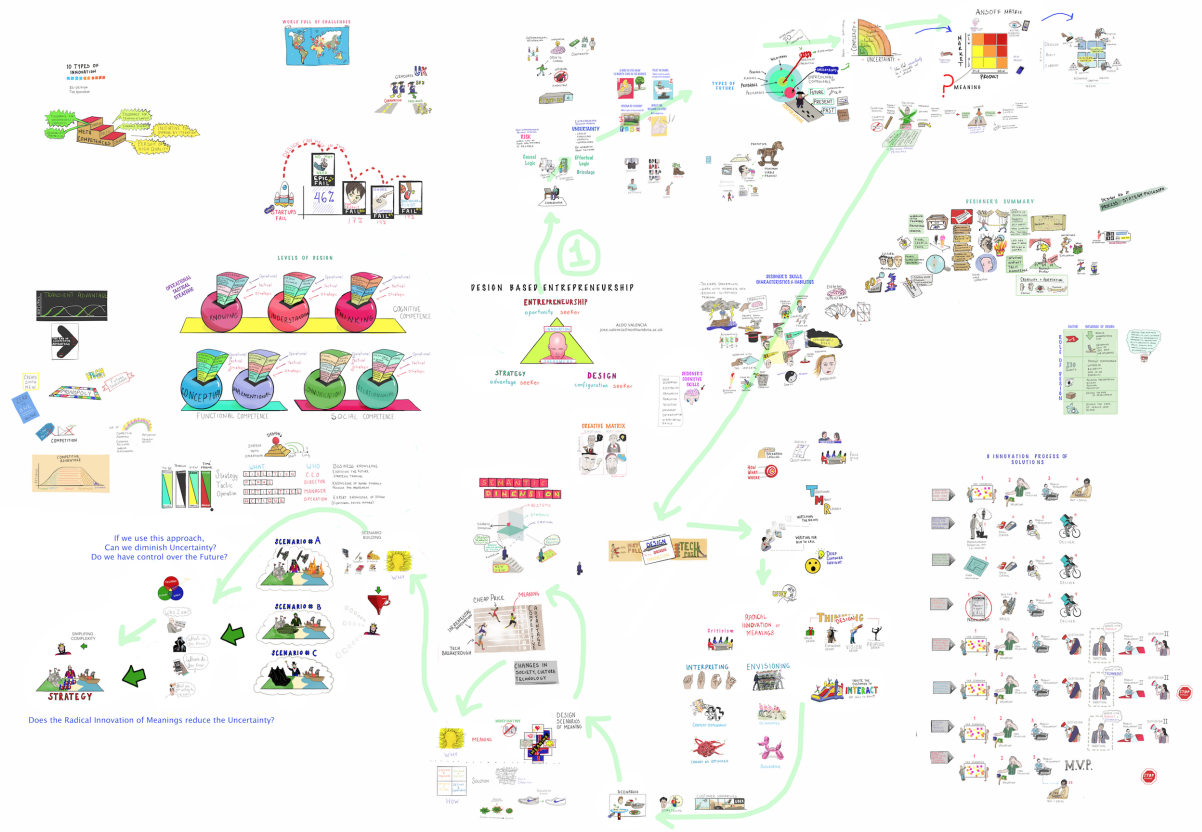


Figure 17. Summary of literature review in doodles.

This map of the literature review was used as a prompt in the interviews with academic's experts and some key actors in the design entrepreneurial ecosystem. Their ideas were recorded, and their feedback is taken into consideration to improve the understanding of this issue. The green arrow shows the sequence of the narrative.

3.10.1.3 Multimedia aid: Video

A video with a voice-over explaining the map was developed using the map in figure 18 to send over to the stakeholders. A sample of this exercise is shown in the following lines. This study needed to gather feedback from multiple stakeholders. In the academic case, the best way to see if the theory proposed was effective was through submitting papers to major conferences and journals, and the other one was asking recognised experts in the field of Design, Entrepreneurship and Innovation about their take on the matter.

To get the idea across among scholars, investors, entrepreneurs and the rest of the members of the ecosystem, the researcher produced a short introduction-video, which pans across the key sections of the drawn map of the literature, with a voice-over explaining each section, how they

connect and how the viewer themselves could contribute by being part of the research. This introduction video was sent to participants before the interview.

The footage consisted of a set of doodles, guided by the existing literature. The voice-over connected the ideas to explain the research as concisely as possible. This video introduced the potential interviewee to let them know where this research was coming from and where his/her knowledge fit. This helped to set up the basis of the inquiry. The script can be found in Annex A.

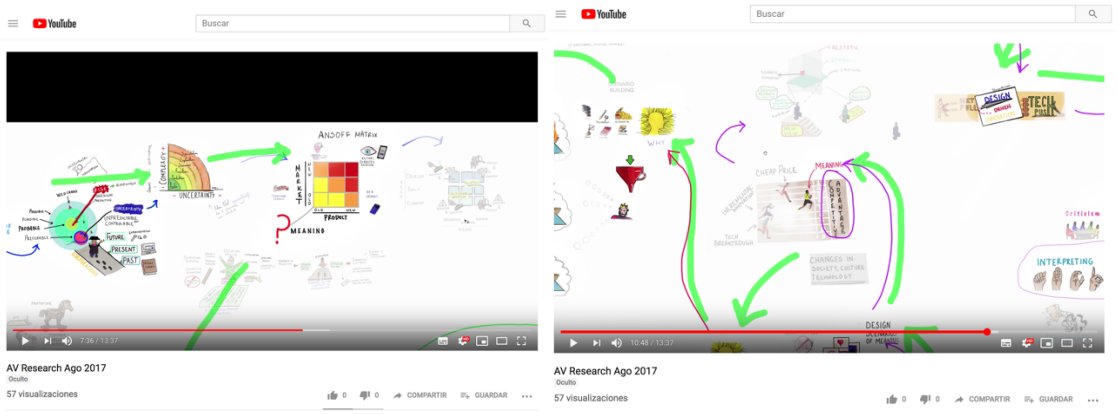


Figure 18. Samples of the video sent over to participants who were far abroad. See QR code below.

3.10.2 Visual aids for Phase Two data collection

3.10.2.1 Tools to analyse the information

The typology, developed in Chapter 1 was suitable to analyse the information available online about the Designer Entrepreneur's journey when they started their business. This typology provided an overview of theories that could be used as a lens to begin analysing the actions taken by entrepreneurs and designers. By mapping out essential vocabulary from a range of models of entrepreneurship and design theories, the framework equipped the researcher with listening tools to help identify actions relating to particular models of entrepreneurship and design approaches. Nevertheless, the form of this typology makes the analysis difficult because of its readability. Therefore, the researcher explored a range of ways that the framework could be adapted to make it visually easier to interpret by the participant in a time-limited interview situation.

3.10.2.2 Different ways to represent the DECPI preliminary typology

In Phase Two data collection, the framework DECPI was used to support the template coding of the data obtained from Designer Entrepreneurs. This a priori analysis of the data was

conducted manually; therefore, the researcher needed a practical way to use the DECPI framework. Multiple ways to support this analysis were created. In Figure 19, an Orbital DECPI is shown and figure 20 shows the DECPI framework in the form of a list.

Figure 19. DECPI preliminary typology depicted in a circular mode.

Context		Thinking		Process		Attitudes		Intent / Strategy	
Big picture	Detail oriented	Designer Mindset	Business Mindset	Iterative Process	Linear Process	Risk Takers	Risk Aversion	Value Driven	Profit Driven
Scarcity	Plenty of Resources	Innovation Mindest	Franchise Mindest	Ethnography	Non-ethnography	Empathy	Non-empathic	Purpose Driven	Policy Driven
Given Means	Acquire new resources	Strategic Mindset	Operational Mindset	Make-do	Planning	Disrruptive	Conservative	Vision Driven	Short term ision Driven
Empathic Understanding	Pragmatic understandign	Combinational Thinking	No-Combinational Thinking	Hypothesis Driven	Objective Driven	Resourcefulness	Lack of resourcefulness	Divergent Thinking	Convergent Thinking
Whom do you know	Get inside new networks	Visual Thinking	Non-Visual Thinking	User Center	Product Center	Leverage Circumstances	Avoid to Leverage Circumstances	Experience Driven	Non - Experience Driven
		Explorer Mindset	Non-Explorer Mindset	Rapid Prototyping	Detailed Prototyping				
				Co-creation	Creation				

Figure 20. The DECPI preliminary typology represented in a list. This list is complemented with the opposite concept to facilitate the contrast of ideas.

3.10.3 An app for the DECPI preliminary typology

Different ways of analysing the information were explored, including the possibility of building a quick app that facilitates the identification of the elements of each theory and allowing the researcher to have a report on real-time. This app (figure 21) would have on its database the different theories of the Design Entrepreneurship for consumer product innovation's framework.

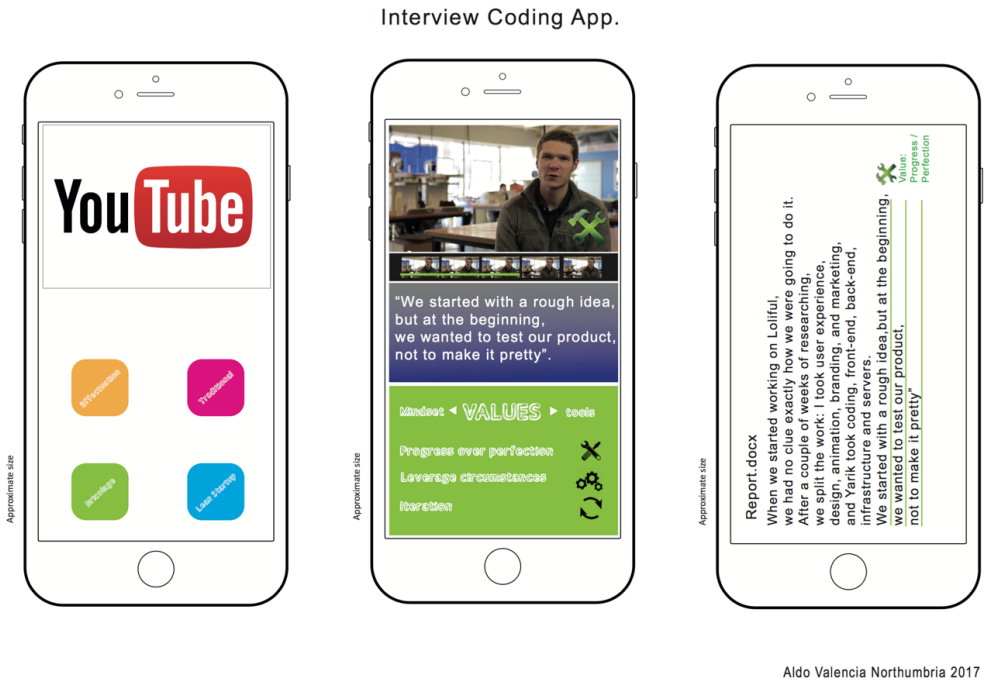


Figure 21. An app that help coding semi automatically was considered.

The purpose of developing a visual tool out of the framework developed in Chapter 1 was to help the researcher in the classification of the interviews, by showing a clearer breakdown of the elements of each theory.

3.10.3.1 Potential downside of the development

The developing time and the potential bugs of this application made this idea less suitable to compare and analyse the information. At this stage, not all the incoming information would have the same format (structure of the questions) requiring a more extended period of development and testing. The researcher looked for different ways to ease the analysis process of this stage, finding different tools that might contribute to expanding the understanding of the phenomena.

3.10.4 Pre-testing the DECPI preliminary typology

The Design Entrepreneurship for Consumer Product Innovation typology was developed to facilitate the identification of patterns and relationships between the stories from real entrepreneurs, and the available theories for Design and Entrepreneurship.

This tool was tested with secondary data available on the web. Down below in figure 22, there is an example elaborated with the available video of Brian Chesky (designer), founder of Airbnb, talking about the entrepreneurial journey and how he and his partner became entrepreneurs. This interview was conducted by Reid Hoffman, founder of LinkedIn, at Stanford University (Greylock Partners, 2015).

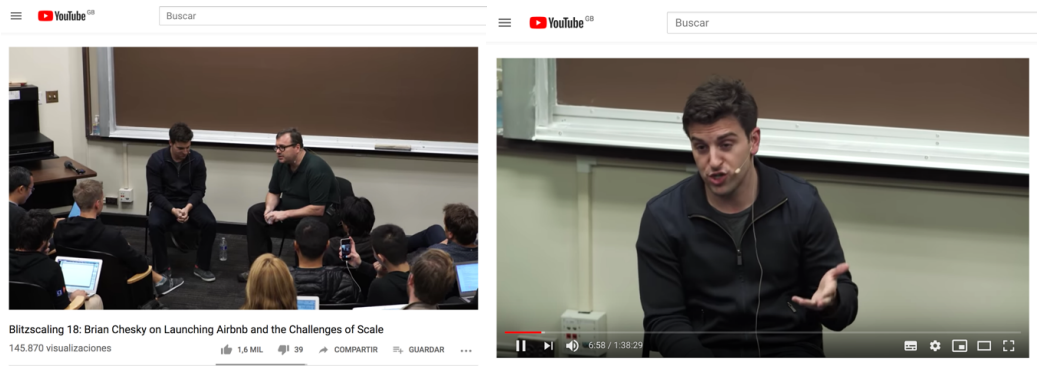


Figure 22. Interview of Brian Chesky, founder of Airbnb, talking about the entrepreneurial journey and how he and his partner became entrepreneurs.

3.10.4.1 Comparing the theory with evidence

The DECPI preliminary typology was compared to existing examples of Designer Entrepreneurs, to find out if there are concordance between the theory and the evidence.

The concepts expressed in the DECPI preliminary typology were compared with the source.

Table 7. A brief example of the identification of some of the elements of the preliminary DECPI typology

Theme	Minute	Code
Explorative Thinker	01:28:13 00:50:05	However, at RISD they told you because you were a designer, you could change things—that I could go out and do and change anything I wanted to do I also write an email every single night to the whole company. This isn't a tactical email but something more thought provoking.
Risk Taker	00:11:49 00:28:54	And that was kind of a crazy idea. It almost scared us. It seemed insane that you would actually be able to pay somebody else and be able to book something with them and you would get a reputation system. We decided, let's just do it. Being provocative was good because people would tell other people about it
Whom do you know?	00:06:30 01:06:40	Joe could do front-end engineering, but we were both designers and product people. And Joe said, "Well, my old roommate, Nate is a computer scientist. He went to Harvard; he was a computer scientist. And so, the three of us got together and we said, we basically had this core idea. We said, what if you could book someone's home the way you could book a hotel, anywhere in the world? Building a community worked for us. And we built a company long term. And the ultimate way we won is, we had a better community.
Human Centred Approach	00:22:21	The most important of this advice was that it was better to have 100 people who loved us vs. 1M people who liked us. It's much better to get 100 people to love you. There was no way we could get 1M people on Airbnb, but we could get 100 people to love us. This is when we decided to do things that wouldn't scale. Getting 100 people to love you is hard—getting people to like you is much easier than

	00:47:03	getting people to love you. I think hiring's the most important thing to culture. Because you're bringing people in, and so the culture becomes the people around you. And so, the main thing is the hiring. I decided to interview every single person, which is not crazy when you're five employees, but I think I interviewed the first few hundred employees.

Figure 23 shows the visual tool. It made things easier to identify.

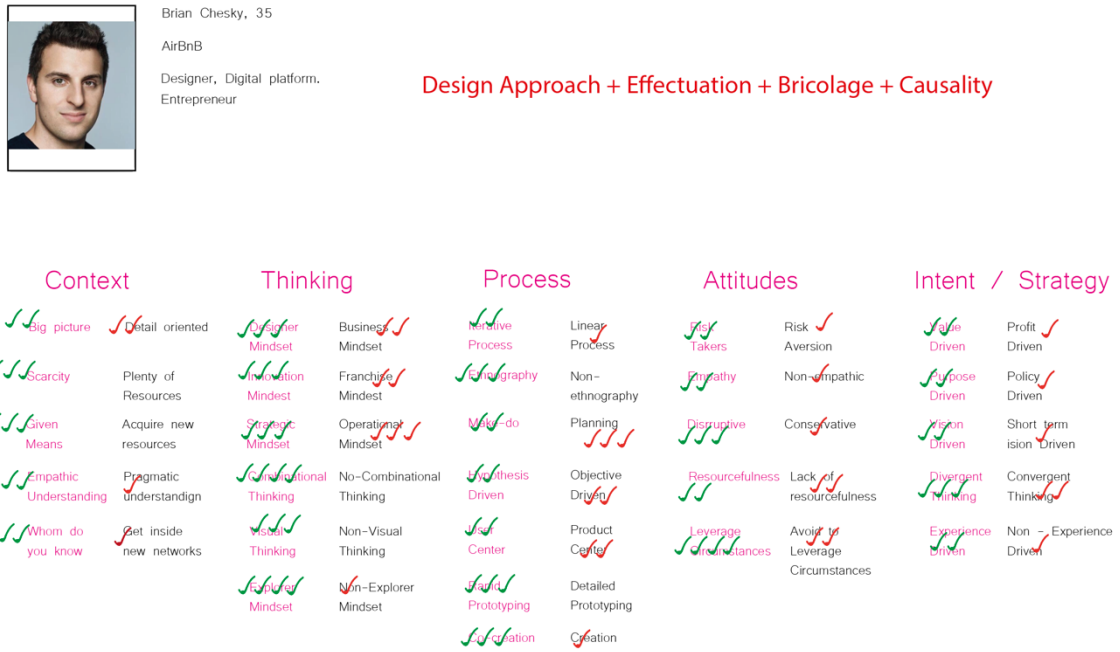


Figure 23. The DECPI preliminary typology after contrasting it with the Brian Chesky founder of Airbnb entrepreneurial journey.

Table 8. A brief example of the identification of the some of the elements of the DECPI preliminary typology in the F7's entrepreneurial journey

Theme	Minute	Code
Big Picture	04.05	I wanted to find the biggest challenge and tackle it. Once I did the deep dive, I realize the importance to start with the problem not with the solution.

Innovation mindset	00:07:56 00:10:03 00:11:04	I wanted to solve the problem of bicycle fatalities. First, I thought of inventing a bicycle break light, but then I realize that the problem is that big cars ahead of you can't see you when they turn. I don't have all the answers but I can try. You have to put yourself in the position to learn. This need to become a reality, it's too good to leave it behind. I patented at Uni.
Explorer mindset	00:47:10	I follow my gut, I don't think there is a particular relevant experience for what we are doing. We are still finding out what we are doing. That is why I like to try out new and young people willing to learn, willing to explore.

Figure 24. Similarities of the entrepreneurial journey of F7[3] from BikeLight[4] and the DECPI typology. The picture has been anonymized.

Figure 24 shows the results of another Designer Entrepreneur, F7 from bikelight.

[3] Her personal data that has been anonymized

[4] This is a pseudonym name

3.6.4.2 Missing points of the DECPI preliminary typology

The previous activity not only helped the study to observe the coverage of the DECPI preliminary typology, but it also helped to find potential areas overlooked by it. As a result, the researcher observed that there were some missing points in the designer´s entrepreneurial journey that were not covered in the DECPI preliminary typology. The pre-testing of the DECPI preliminary typology showed that, though the available entrepreneurial studies and methodologies could offer reliable guidance on how designers can set up a company, they do not offer any guidance on how designers change their mentality to become entrepreneurs. There was not enough evidence of this claim, yet there was a slight indication that there was another subprocess parallel to the entrepreneurial and new product development processes; a process that showed the bridge from being a designer and becoming an entrepreneur. The researcher of this study focused his efforts to find new insights about the topic.

3.7 Milestones´ visual aids

Imagery in this study supported part of the data collection in this study. In order to cover a large range of topics in each interview, the researcher had to synthetize the information in visual maps and prompts. The imagery allowed the researcher to have a richer conversation with the participants of the study.

3.7.1 Reasons why start-ups fail map

Alongside the literature review map, the researcher gathered the studies available of the reasons why start-ups failed from sound research and integrated a map to encourage the interviewees to talk or chat about their experiences. This map was targeted at business incubators and Designer Entrepreneurs. By knowing what their failures, struggles and challenges were, the study could bring more ideas to the table.

In Chapter 2, different studies were presented, explaining why start-ups fail. After gathering these studies, the reasons were grouped insignificant cluster trying to find similarities among them. As a result, in figure 25, six major clusters were identified. Figure 26 shows the researcher sorting the clusters. Figure 27 shows the preliminary classification of the start-up´s failures.

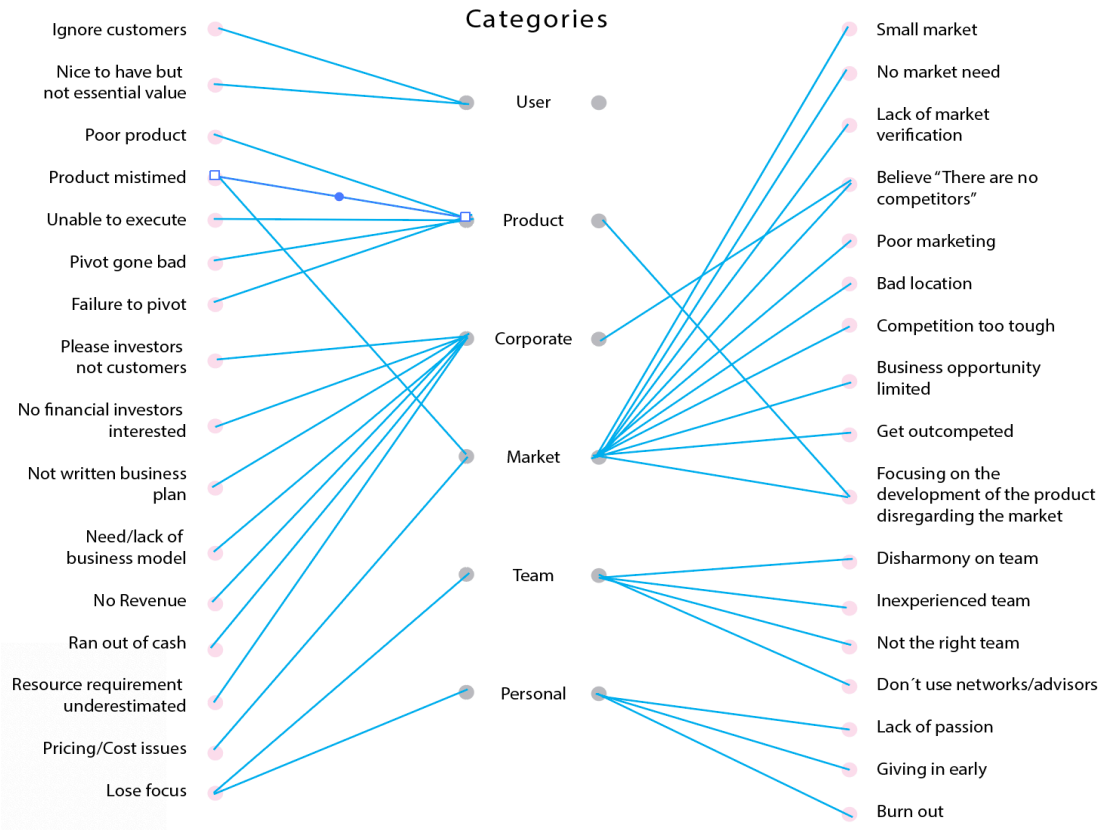


Figure 25. Classification of the start-up failure problems into six different themes

Figure 26. Sorting process

User/customer	Product	Corporate	Market	Team	Personal
Ignore customers	Poor product	Please investors not customers	Small market	Disharmony on team	Lose focus
Nice to have but not essential value	Product mistimed	No financial investors interested	No market need	Inexperienced team	Lack of passion
	Unable to execute	Not writen business plan	Lack of market verification	Not the right team	Giving in early
	Picot gone bad	Need/lack of business model	Small marketing	Don´t use network / advisors	Burn out
	Failure to pivot	No revenue	"There are no competitors"		
		Ran out of cash	Poor marketing		
		Resource requirement underestimated	Bad location		
		Pricing/Cost issues	Competition to tough		
			Business opportunity limited		
			Get outcompeted		
			Focusing on the development of the product disregarding the market		

Figure 27. Start-up´s failures preliminary classification table.

A brief explanation of these clusters is shown below:

1) User: this category covers everything from consumer/user´s needs, desires, and specifications coming from them
2) Product: this category deals with the technical issues and configuration of the solution
3) Corporate: refers to the legal, economic, management of resources and business´ operations issues.
4) Team: the classification dealing with the management of talent and human resources
5) Individual: personal development as entrepreneurs such as knowledge, skills and experience
6) Marketing: contains everything related to the market, timing, competition and exogenous threats

Several theories were analysed to identify what methods and tools can contribute to reducing the odds of starting up a business.

After classifying the reasons into the table above, a preliminary map was developed to make it more visual. Different iterations help the researcher refine the idea.

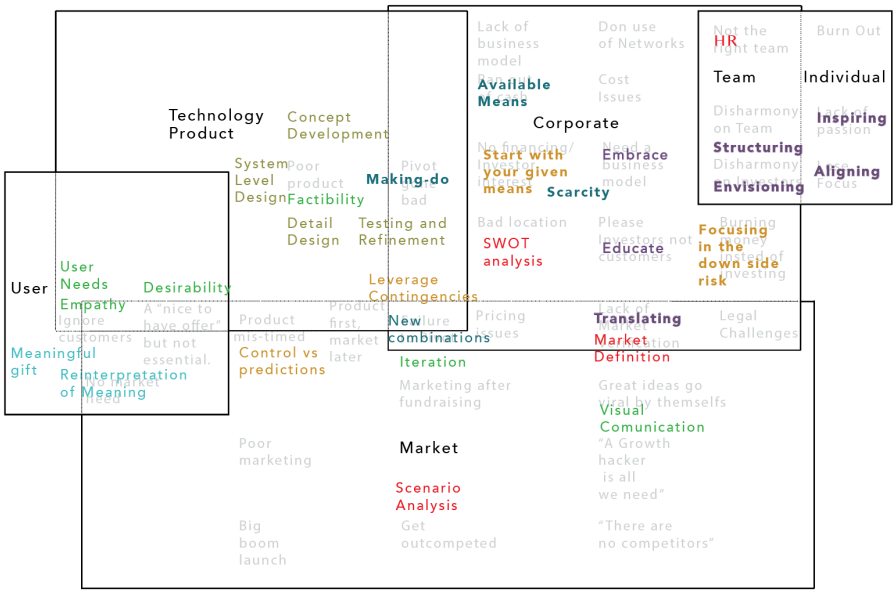


Figure 28. The author's development of the map. First attempt.

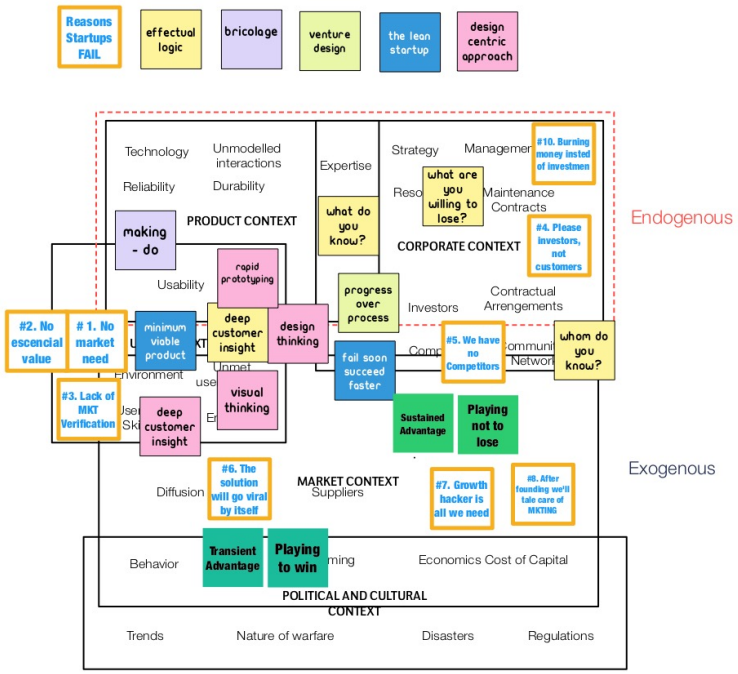


Figure 29. This proto-maps show the development of the map and the iterations made to it. Third attempt.

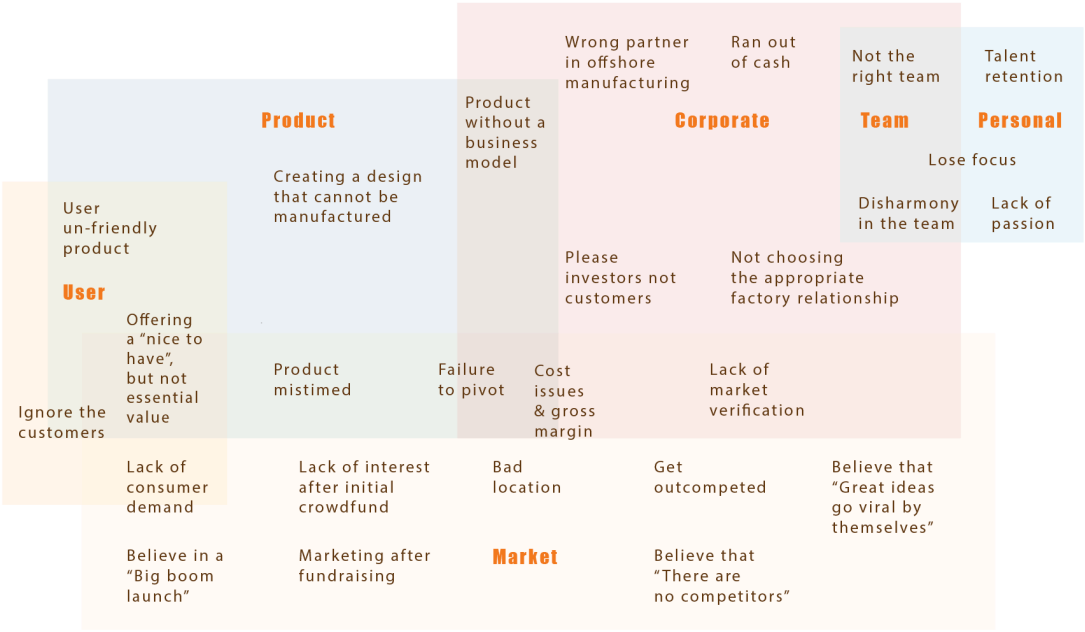


Figure 30. Map of the reasons why start-ups fail. Final version.

According to the literature review, Design and Business disciplines can contribute to diminishing the pitfalls encountered by start-ups, but this needs to be tested or compared with empirical data. The above map shows a summary of the reasons why start-ups fail.

Down below, a detail of the previous map is shown. Inside the dotted perimeter, there are the reasons that Designers can naturally contribute to diminishing according to their skillset and methodological tools. Entrepreneurs, Designers, academics and investors were expected to provide insights on how they have tackled these issues (if they have gone through them).

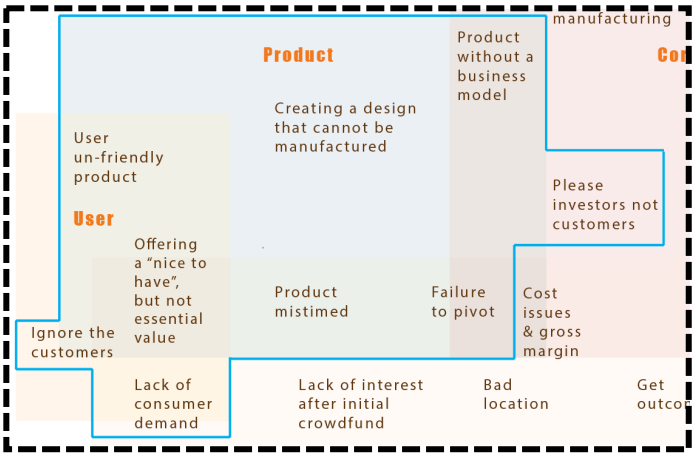


Figure 31. Detail of the pitfalls where designers can naturally contribute to diminish.

3.7.2 Map of entrepreneurial Milestones

In Chapter 2.5.2, eight types of innovation processes were introduced based on Salerno (2014). This information was used as a reference to outline the stages of the entrepreneurial journey. Different sources have been integrated into the final map based on sound research (Luo, 2015; Rothwell,1994) to complement Salerno´s categorisation. A map containing the milestones of each innovation process was created (figure 32 and 33), to locate the potential milestones of the entrepreneurs.

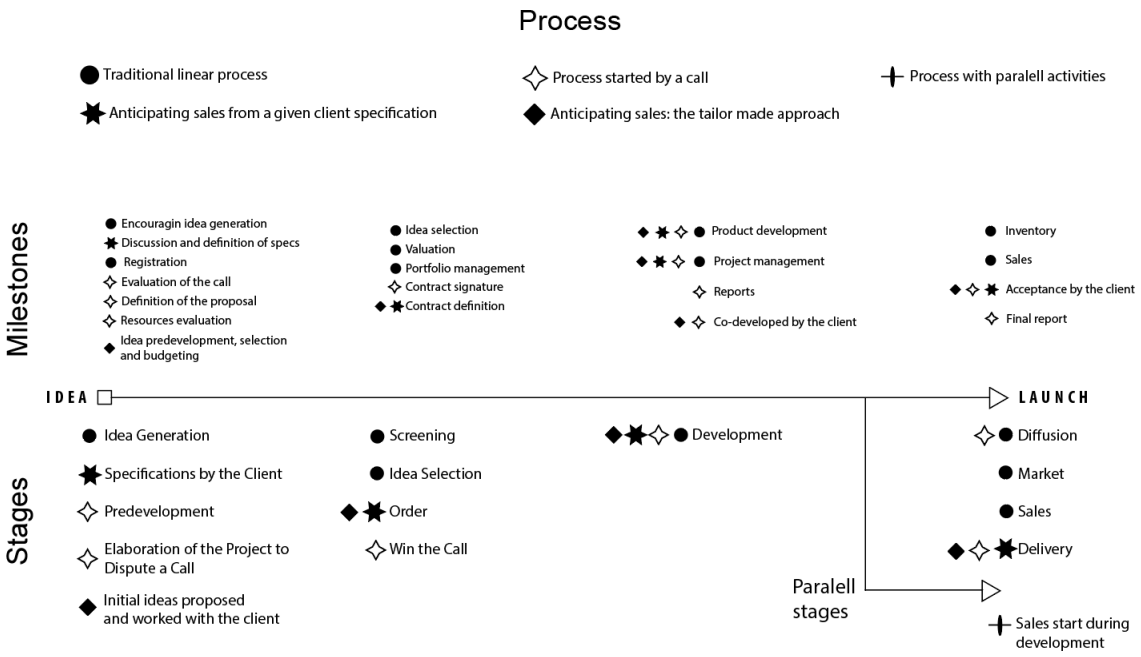


Figure 32. Description of the innovation processes identified by Salerno (2014). Part 1.

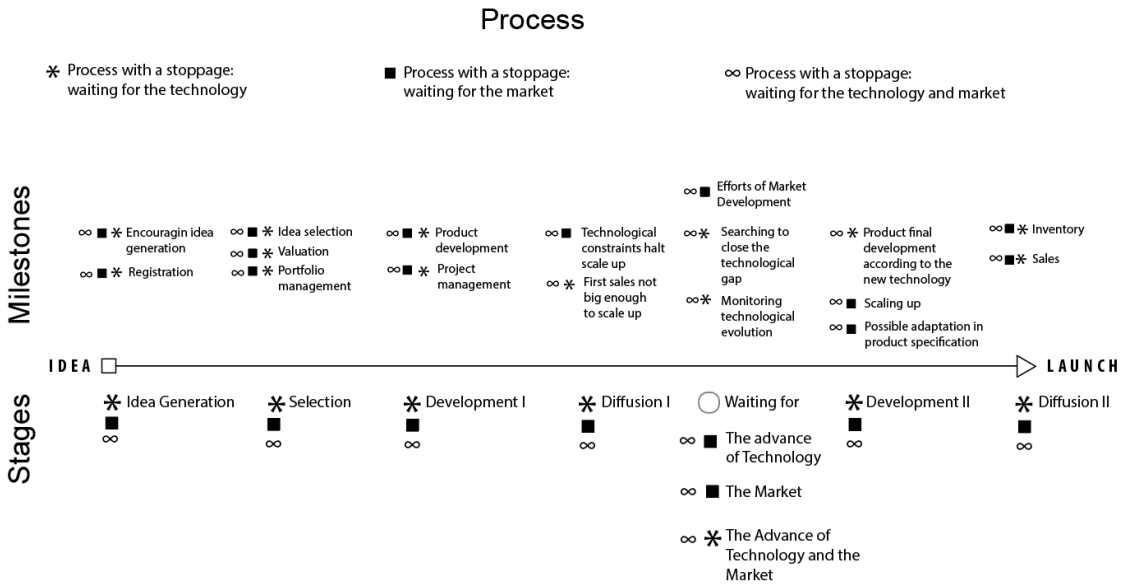


Figure 33. Continuation of the Description of the innovation processes identified by Salerno (2014). Part 2.

3.7.3 A description of the milestones

To allow participants tell a chronological story about their start-up, a map with imagery was created to facilitate de identification of each milestone (figure 34).

Figure 34. Creating the Imagery to identify the milestones used by the entrepreneurs. Left side: Creation of imagery for the visual aids. Right side: Reduction of complexity for the probs.

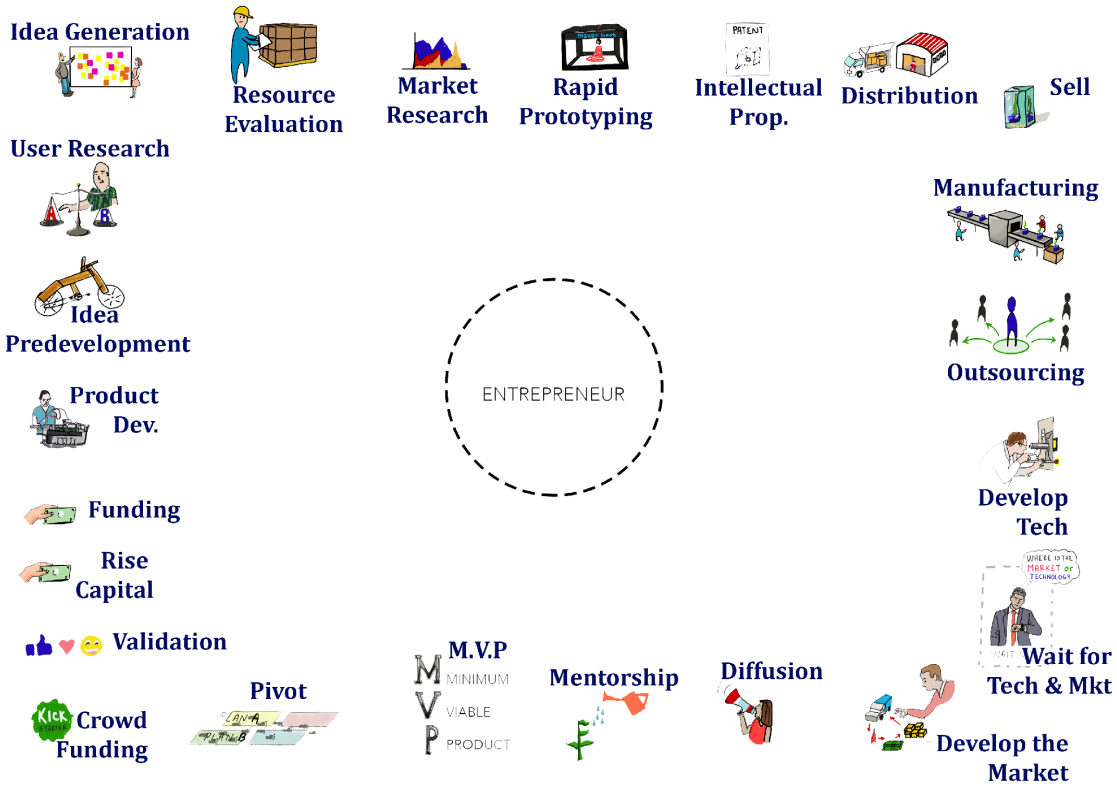


Figure 35. Possible milestone of the entrepreneurial journey.

The iconography showed in figure 35, represents each possible milestone that the entrepreneur took to start up his/her business. This tool stimulated conversation which released useful new data into the study. For example, when F1 (founder 1) and F2 (founder 2) explored the map, they immediately stressed their experiences around detail manufacturing plan and finances. For them, those were the most important reasons why start-ups failed. Based on their own experience, they picked up on their lack of "real" industrial design acumen, despite being prompt designers and spoke at length of the importance of making sure of having someone expert in the field at hand. Figure 36 and 37 show the cards sets developed as visual prompts to facilitate the interaction with the participants.

3.7.4 Cards containing the concepts of the DECPI typology.

Figure 36. Score cards developed with the principles found in the Literature Review.

Figure 37. Full view of the cards developed with the principles found in the Literature Review.

3.8 Visual aids as research tools

This chapter describes how the researcher utilized imagery in his investigation to support the enquiry throughout the study. He summarized his literature review in multiple visual maps that later on were used as visual prompt to support the enquiry.

3.8.1 Visual methods as a way for enquiry in CGT

Charmaz advocates that the grounded theorist can adapt the strategies depending on the exigencies of the studies.

> *"Grounded theory strategies are few and flexible, so researchers may adapt them to the exigencies of their studies. Thus, a researcher has latitude not simply to choose the methods but also to create them as inquiry proceeds. Grounded theory consists of transparent analytic guidelines; the transparency of the method enables researchers to make transparent analytic choices and constructions. The researcher can see and create a direct relationship between data and abstract categories" (Charmaz, 2008, p.162).*

Once the literature review was completed, the researcher started capturing the main ideas into a map formed by doodles.

3.8.2 Visual thinking

Visual thinking as a means of enquiry interviews relies on transcribed data to understand the narrative of the participant´s experience. Social Researchers recognise that the use of maps and diagrams taps into the visual thinking as a form of enquiry and as a cognitive tool to augment memory and information processing (Tversky and Lee, 1998; Larkin and Simon 1998). Visual thinking is also considered the 'dominant instrument' of exploration (Grey and Malins, 2004). The graphics of information and communication utilise images that can evoke instantaneous recognition and association (Saldaña, 2015). "Visual research methods are now widely recognised as having the potential to evoke emphatic understanding of how other people experience their worlds" (Mannay, 2015, p. 45). If this visual information can evoke these associations and augment memory and information processing, it might provide insights that a regular interview cannot.

Visual methods have been used to generate data in the social sciences (Warren, 2009). Anthropology and sociology take visual artefacts as their unit of analysis. Although this has proved its validity, visual studies of organisational life have been slow to appear (Strangleman, 2004). The emergent adoption of visual methods in organisational research has been used to generate data about organisational phenomena (Vince and Warren, 2012), such as strategy (Meyer, 1991), process re-engineering (Buchanan, 2001), leadership (Wood and Ladkin, 2007) and fun at work (Warren and Fineman, 2007). In this part of the study, visual support would enable the entrepreneur/designer to express beyond words and fixed answers to discover deeper insights. This section is still under developing the trials and test.

3.8.2.1 Visualisation

Scholars recognise how visualisation supports the design process (Goldschmidt, 1994). There are numerous benefits identified by scholars, such as: idea generation enhancement and creativity (Atilola et al, 2016) and structural thinking (Jarzabkowski, 2015). For this research, visualisation is a graphical mapping of concepts structured in a meaningful way (Bertschi et al. 2012).

3.8.2.2 Why visual thinking and visual methods

For a long time, visual methods have been used to generate data in the social sciences (Warren, 2009). However, as Strangleman observed in 2004, visual studies of organisational life had been slow to appear (Strangleman, 2004). The emergent adoption of visual methods in organisational research has been used to generate data about organisational phenomena (Vince and Warren, 2012), such as strategy (Meyer, 1991), process re-engineering (Buchanan, 2001), leadership (Wood and Ladkin, 2007) and fun at work (Warren and Fineman, 2007).

Visual thinking does not portray reality; instead, it conveys the conceptions of reality. Diagrams, maps and sketches use elements and spatial relations on paper to represent concepts incorporating the relevant information and dismissing the irrelevant. The order of drawing reflects the mental organisation of the domain (Tversky, 2002). Arnheim (1997), pointed out the sequence of actions to represent conceptual relations with sufficient precision and complexity, concluding that all truly productive thinking takes place in the perceptual realm and since perceptual reasoning tends to be visual, visual thinking promotes this spatial relationship among the concepts. One clear example is how Leonardo DaVinci used his visual skills to work and think.

Sketches were called '*pensieri'* ('thoughts' in Italian) – thoughts made visible by drawing and enhanced by annotated comments – descriptive, analytical observations and poetic reflections demonstrating a dialogue with himself, and also communicating to others through their clarity and elegance (Grey and Malins, 2004)".

3.8.3 Summary of the literature review: A visual integration

The literature review helped the researcher to answer some of the previous questions raised at the beginning of the research, but at the same time, it brought up more interrogations about the boundaries of the field and what has been researched in the area. The gap in the knowledge became clearer as the lit review went on. However, the best way to spot deficiencies or opportunity areas to expand the research was by utilizing imagery. The following maps show the way that the researcher made sense of the vast amount of information gather during the literature review..

3.8.3.1 Visual documentation of the literature review SENSE MAKING

One of the first steps for the researcher was to document the knowledge gain with every document, paper, thesis and media. The researcher started creating mind maps, to connect the ideas and tension the theories found. As soon as the mind map started to get more complex, the researcher decided to follow the principle of "An image is worth a thousand words".

One of the first set of theses given by the supervision team was the doctoral thesis of alumni from the Department of Design at Northumbria. Figures 38, 39, 40 and 41 show the result of the visual summaries of those theses.

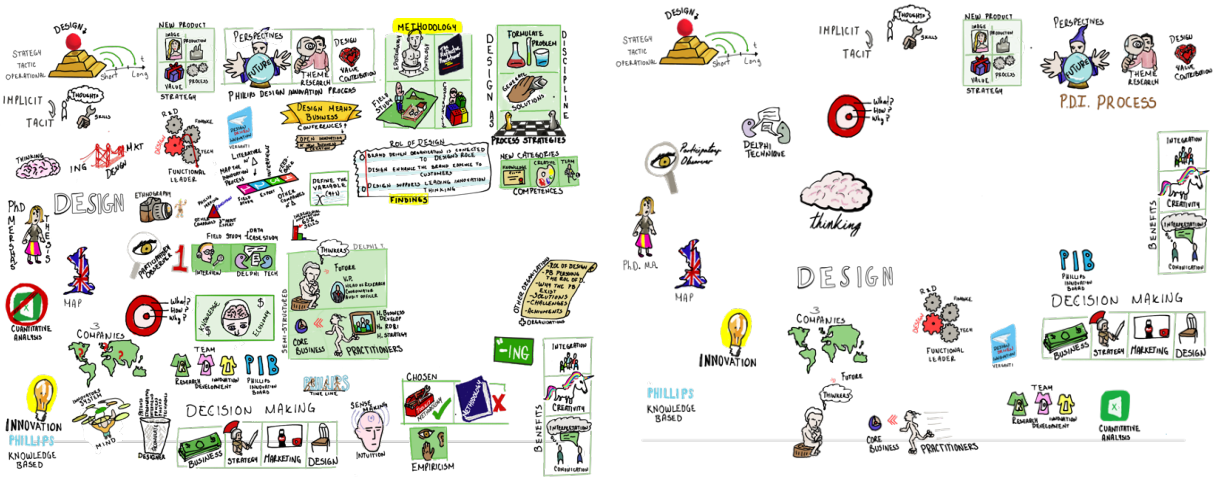


Figure 38. Visual extract of the map of thesis reviewed, Dr. Aftab doctoral theses (Aftab, 2013).

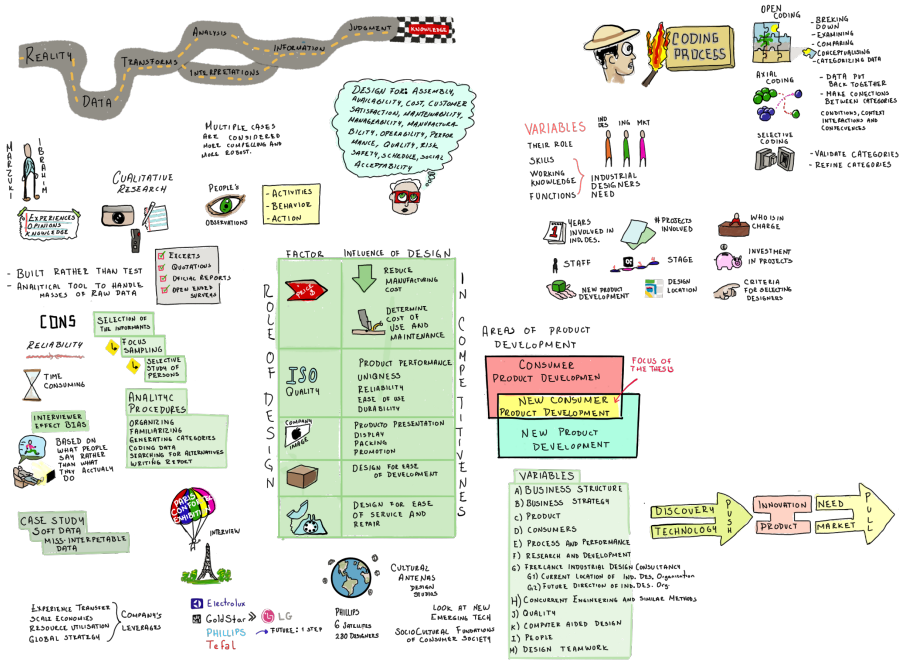


Figure 39. Visual extract of the map of thesis reviewed, Dr Ibrahim Marzuki´s doctoral thesis (Marzuki´s, 1999).

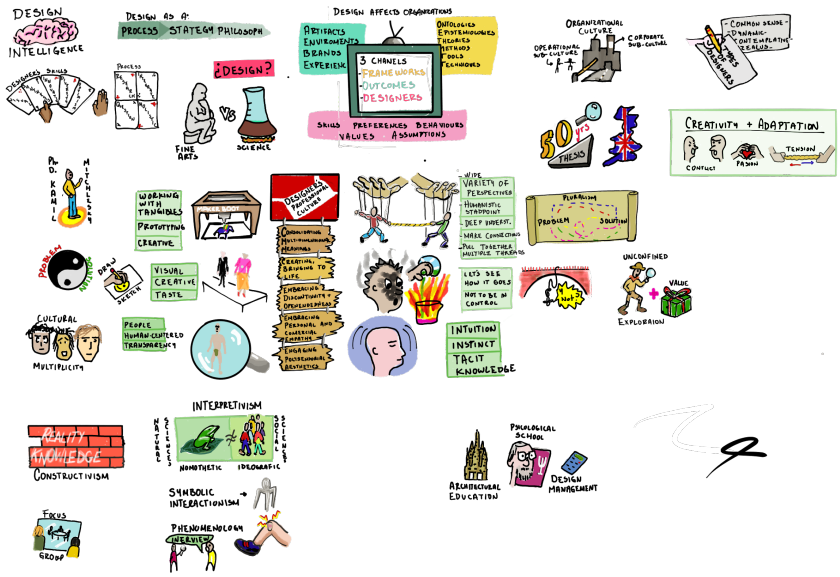


Figure 40. Visual extract of the map of Dr Kamil Michlowski's doctoral thesis (Michlewski, 2006).

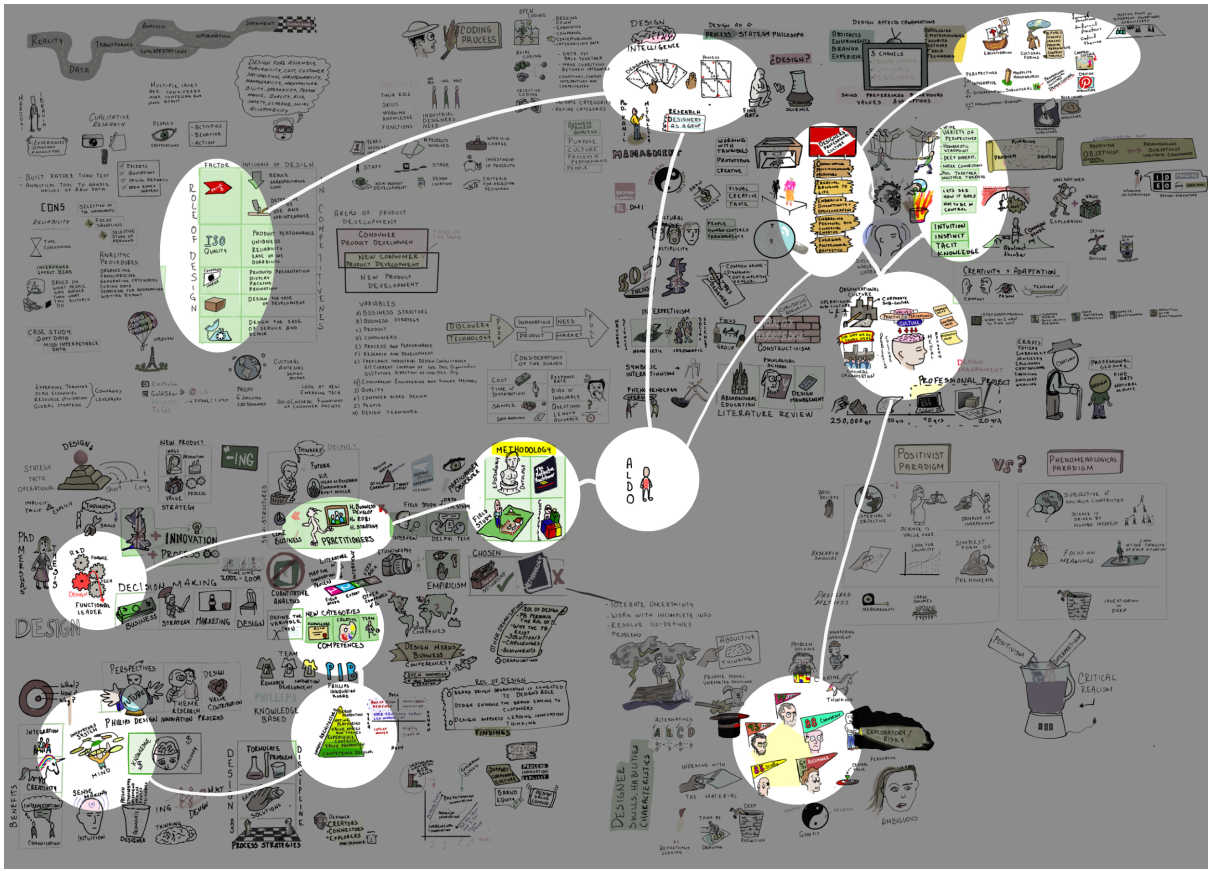


Figure 41. A visual summary of the literature review suggested by the supervisor's committee. Emergence of connections between concepts, methods and gaps in the knowledge

CHAPTER 4 - DATA COLLECTION PHASE

4.1 Introduction field work: two phases of data collection

This study consists of two data collections phases. Due to the lack of empirical annotation about this issue, for data collection Phase One, an explorative method was utilized to gather primary data. This model of enquiry evolved with each successive interview/encounter, to take advantage of the emerging insights. This flexibility in the investigative process opened new inquiries, of which some were reassuring, reasserting while others had earlier viewpoints and also elements of the theoretical review as described in Chapter 2 of this study. After this first phase was concluded, the second phase started, with a more profound and detailed enquiry specifically addressed to Designer Entrepreneurs.

In data collection **Phase One**, the research gravitated around the 'entrepreneurial ecosystem'. The body of knowledge constructed in the literature review and the DECPI typology of design-based entrepreneurship from Chapter 2.1.6, is the frame where the basic non-structured interview model for Phase One emerges.

The flexible and inductive process that CGT allowed the researcher to explore potential leads that contributed to the sense-making of Design Entrepreneurship issue, and also supplied with information capable of giving shape to the interview model for Designer Entrepreneurs. Each member of the entrepreneurial ecosystem brought different perspectives to the study. Therefore, the questions asked varied, depending on the expertise, the discipline and the role represented inside the ecosystem.

This chapter explains how this inquiry evolved with each interaction with the members of the entrepreneurial ecosystem. It equipped the researcher with a solid overview of the issue and established the foundations to build a more productive interview model for Phase Two, oriented towards Designer Entrepreneurs exclusively.

Data collection **Phase Two** focuses on the experiences and the milestones that Designer Entrepreneurs went through in their entrepreneurial journey. The aim of this phase is to elicit the most detailed picture of the designer´s product and business development journey. The chronology of events, as well as the challenges and changes experienced in the mindset, are captured in this phase.

The emerged codes and themes, as well as the description of their interconnection, are presented in this chapter, followed by the key insights from designer entrepreneurs. The chapter

ends with a visual and written summary of the research and maps the characteristics of the participants.

4.1.1 Crafting the enquiry through Constructivist Grounded Theory

In GT the first data set is analysed to provide a guide for the next stage of data collection. This is aligned with the constructivist approach (Alemu et al., 2015). As reported by Guba & Lincoln (1989), the constructivist seeks to refine the study; as each datum is collected and each element of the joint construction is devised, the design itself becomes more focused. The more familiarised the scholar is with the preliminary outcomes, the more directed is the sample and the data analysis specific and the construction more definitive. Each datum added something to the study, shaping the process with insights that conducted the study in a non-linear and iterative process. The interview model for Phase Two of this study was generated after conducting the wide-ranging Phase One interviews, with the stakeholders within the entrepreneurial ecosystem, and following new leads that came up during the process. To narrow down the topic, the researcher focused only on Designer Entrepreneurs running a consumer product start-up.

This phase explored in detail events, sequences, milestones, mind-sets and transitions in abilities and attitudes that designer's entrepreneurs experienced along the entrepreneurial journey.

4.2 Phase One data collection: field work

This chapter only describes the fieldwork and the findings of Phase One.

The purpose of this chapter is to describe how the research of the 'entrepreneurial ecosystem' in Phase One data collection helped the researcher to craft the final interview model to be applied to Designer Entrepreneurs in Phase Two data collection. In the following sections, the findings collected from this stage will be shared. Each participant contributed to the understanding of the issue, making clear what aspects had not been covered by previous research, raising questions about what could be improved.

This chapter discusses how the information gathered led to tailoring the final interview model, concluding with the full interview model to be used on the Phase Two data collection. This model combines the set of questions to be asked and the imagery to be used in the activities with the participants. This section ends with a pathway of the interviews conducted by the researcher in a chronological way and the map of doodles containing insights from Phase One data collection.

4.2.1 The starting point of Phase One

The literature review stretched across two disciplinary fields, Business and Design, which use a range of quantitative and qualitative approaches. Insights collected were compiled to understand the overview of the topic and its complexity. Concepts and elements from both disciplines lead the early stage of this research to investigate more about them. A closer look was needed to expand knowledge. The participants in this study shaped the process with their insights and experiences. This study refined the enquiry iteratively with each participant.

4.2.2 Sample of participants

Key actors within the ecosystem were systematically identified through previous online search and university contacts such as alumni, colleagues and professors. The selection of the interviewees for this research did not follow a pre-determined process; instead, following the CGT methodology, the choice of the participants was purposive.

Some potential participants were identified across the United Kingdom. Some of those participants provided the details of a series of consumer product start-ups led by a founding team which, in most cases, includes a designer. For the participants contacted through other means, an online survey (attached to this form) will be applied to meet the specific criteria.

The participants for this study could be found among the Northumbria University's alumni, partners including the network of the Global Entrepreneurial Talent Management (an international, interdisciplinary research and innovation project), the Northern Design Network in the United Kingdom and especially through the contacts made during the early stages of this research.

4.2.3 The interviews in Phase One

In Phase One, a set of questions were integrated into a preliminary semi-structured interview pro-forma. The first round of interviews conducted with members of the ecosystem gravitated around the framework developed in the Literature Review Chapter, and the underlying assumptions of each discipline and methodologies followed. After each interview with the stakeholders, the questions were reviewed and tailored wherever necessary to improve their pertinence. The participant's experiences and views regarding concepts emerged along with their entrepreneurial journey, their connection with the ecosystem and their role within it. It is worth noting that before each interview, a small search about the interviewee and its company or position was made to get the researcher up to speed and utilize the time in the best way possible. A semi-

structured interview was purposefully done in order to encourage the interaction between the inquirer and the participant, to exchange ideas and reflections of the issue. The first collected data gathered information about the sample and informed about the profile of the participants descriptively.

4.2.4 The entrepreneurial ecosystem.

Participants in Phase One of the study have a variety of backgrounds, roles, task and priorities. Therefore, the themes explored during the interviews varied with each one of them. The questions varied depending on the person, their time and expertise. As the researcher identified more potential actors in the ecosystem, some important themes emerged. The specific themes explored with each of these sub-groups will be in the following paragraphs.

The Phase One data collection gathers data from the following profiles within the ecosystem: Academic experts in the field of design or entrepreneurship; Investors and venture capitalist in the hardware or design sectors; Business accelerators & incubators working with consumer product start-ups; Insiders of platforms and technologies used by designer-entrepreneurs; Non-Designer Entrepreneurs in consumer product start-ups and Designer Entrepreneurs in consumer product start-ups. Figure 42 shows the participants summary.

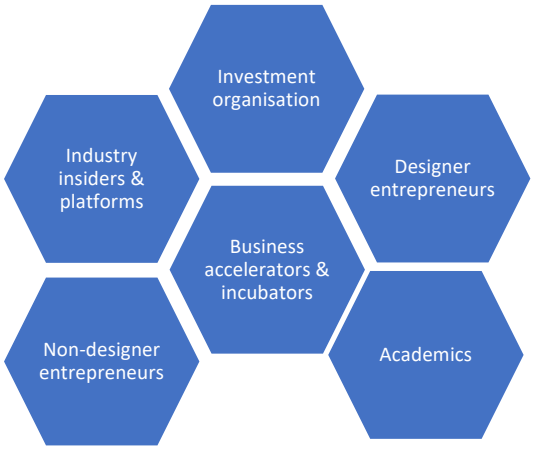


Figure 42. Categories of participants from Phase One data collection – Designer Entrepreneurs´ ecosystem.

4.3 Reaching the members of the ecosystem

Specific contextual elements of this ecosystem were selected to understand how designers, become entrepreneurs, from multiple angles. Entrepreneurs are part of the entrepreneurial

ecosystem, where they interact with other members to set up their business. This study has classified the ecosystem in different categories of actors to help to disentangle the phenomena: Group 1: Academics (researching design or entrepreneurship in leading institutions); Group 2: Investors (supporting product-based or designer-led start-ups); Group 3: Business Incubators and Accelerator; Group 4: Industry Insiders and Platforms; Group 5: Non-Designer Entrepreneurs; Group 6: Designer Entrepreneurs. A map of the entrepreneurial ecosystem was created from the evidence gather of each participant. This map, shown in figure 43, helped the researcher to identify which companies were relevant in the study.

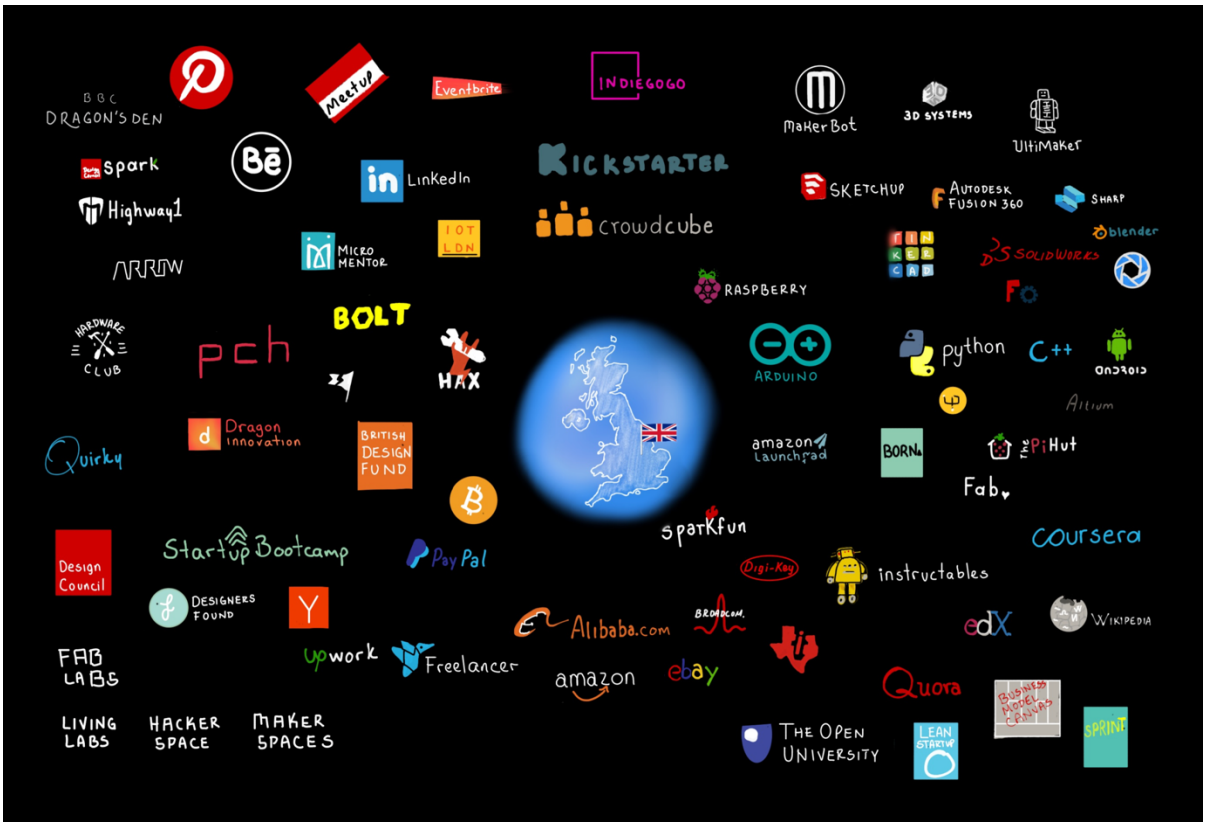
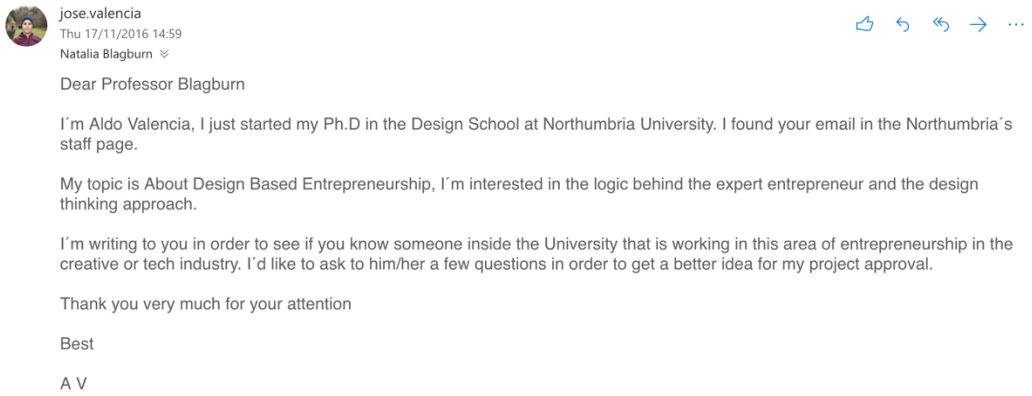


Figure 43. Key actors approached by the researcher in the design entrepreneurial ecosystem in the UK.

4.3.1 Data coming from academics

Due to the location of the researcher and the availability of participants in the academic context, the selected profile to start this research were the academics working in design and business areas. A set of emails were sent to the Newcastle Business School at Northumbria University. Few people responded to the call, and fewer less agreed to have an interview. The rest of the participants have liaised through LinkedIn and Entrepreneurship events.

Figure 44 shows a screenshot of the researcher's first approach with the business school to build up a network that allows him to bounce ideas back and forth and potentially have access to their contacts.



jose.valencia
Thu 17/11/2016 14:59
Natalia Blagburn

Dear Professor Blagburn

I´m Aldo Valencia, I just started my Ph.D in the Design School at Northumbria University. I found your email in the Northumbria´s staff page.

My topic is About Design Based Entrepreneurship, I´m interested in the logic behind the expert entrepreneur and the design thinking approach.

I´m writing to you in order to see if you know someone inside the University that is working in this area of entrepreneurship in the creative or tech industry. I´d like to ask to him/her a few questions in order to get a better idea for my project approval.

Thank you very much for your attention

Best

A V

Figure 44. First approach that unleash the snowball effect with the business school.

As a result of this first approaches, the researcher has had some opportunities to expand his network and have access to opportunities such as research visits, close collaboration with other academics and events where other entrepreneurs liaised, this is shown in figure 45.

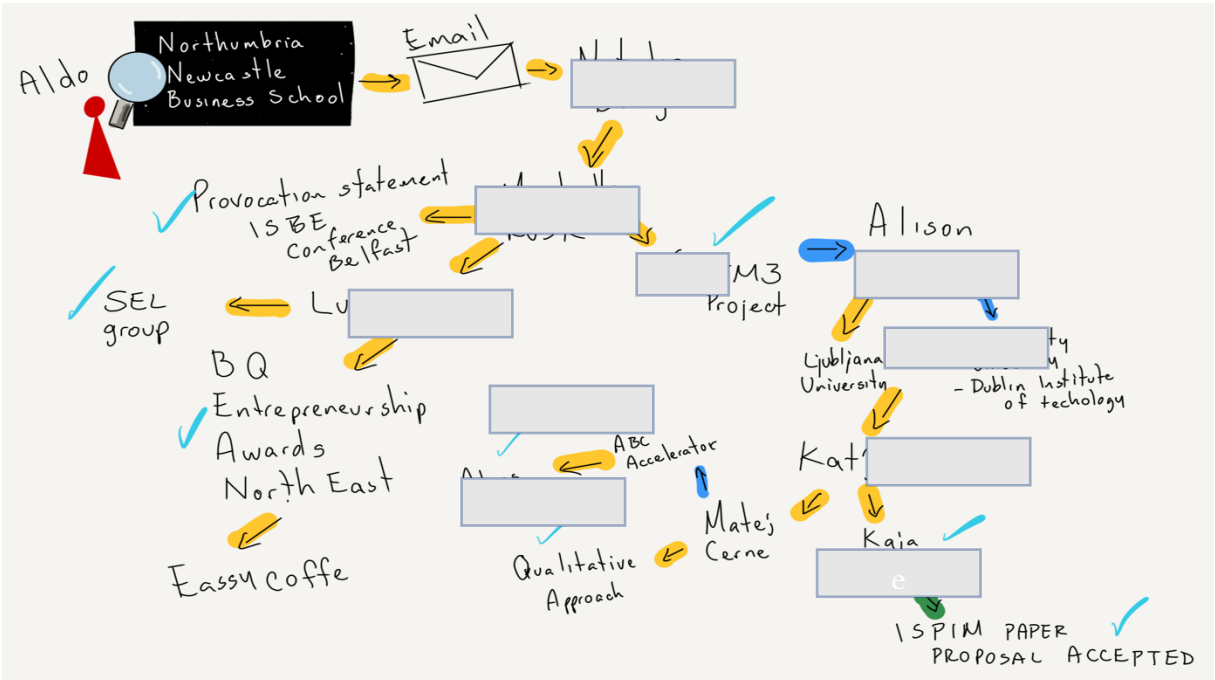


Figure 45. This sketch shows the snowball effect in the Newcastle Business School.

This group is vital to understand the latest knowledge from this issue, from both lenses: Design and Entrepreneurship. The academics in this study are researching about design or

entrepreneurship in leading institutions or research laboratories in the U.K mostly. The purpose of doing these interviews is to know potential theories that explain parts of this issue, as well as bouncing ideas to develop a better understanding of the topic. This interaction helped the researcher to expand the knowledge and in making sense of this topic. The network and connections formed during this phase might be useful for further studies.

The following lines show how the researcher got access to some of his participants, and the link he sent over to prepare the interviewee and maximise the time given for the interview to take place.

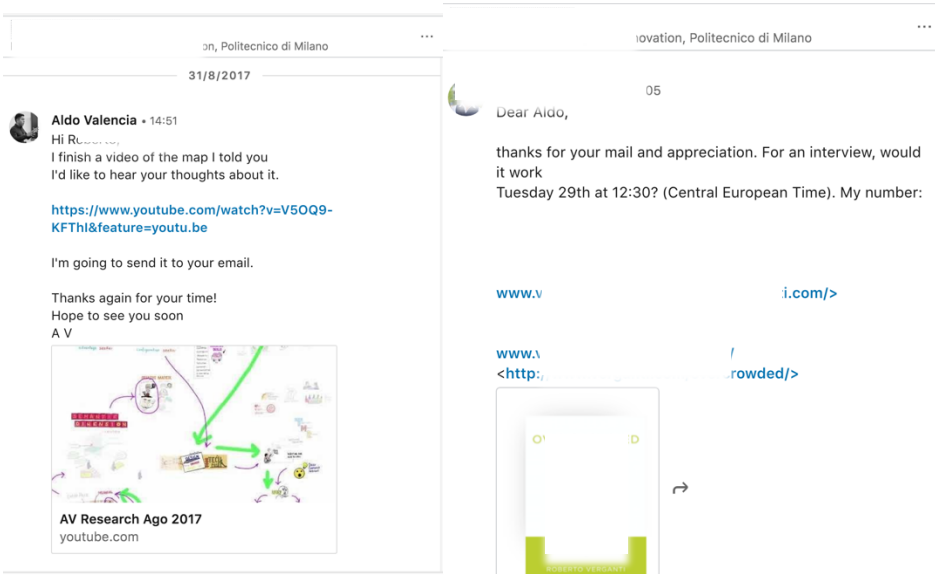


Figure 46. The contact was made and the video was sent prior to the meeting, to maximize the time and explore as many ideas as possible. Critical information has been anonymized.

The sequence of discussions with key academics is illustrated below.

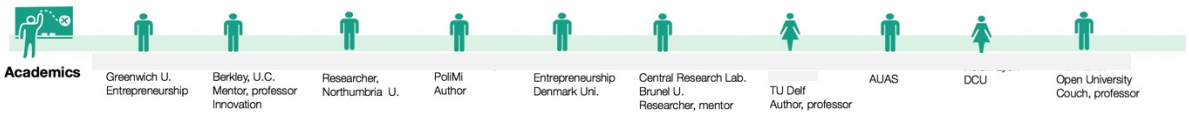


Figure 47. Key business incubators & accelerators.

The inquiry covered a range of questions to support the researcher to describe the state-of-the-art knowledge of the topic (Design Entrepreneurship), potential case studies, and further loose strands in his knowledge.

In some cases, the doodle's map of the literature review was used to drive the conversation. The primary goal for this visual approach was to facilitate the exchange of ideas between the experts in design and business disciplines and the researcher.

Each of the individuals reported in this section will have a summary of the contributions to the research, which will be detailed and described at the end of their case.

4.3.2 Data coming from investors

The researcher sought after investors who supported design entrepreneurs in the North East of the UK using social platforms such as LinkedIn and Twitter. Due to the lack of activity in hardware and industrial design in the North East, this search expanded to places like Manchester, London, Birmingham and Edinburgh.

Two of the most important investors in Design were contacted in London. They showed the willingness to have a chat with the researcher. These two participants are leading organisations that collaborate and run programs to support entrepreneurs with a line-up of mentors and coaches in diverse areas of business and product development.

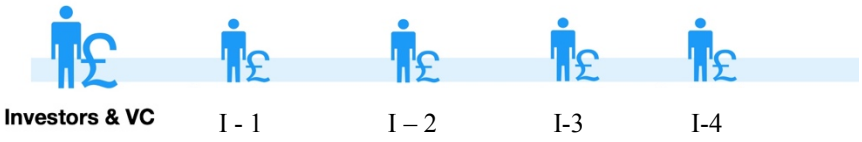


Figure 48. The key investors (Their names have been anonymised, please refer to Annex J for their description).

These are experienced investors in product innovation and in consumer product businesses who are sponsoring start-ups in the UK. The reason to include them in the study is that they are a very active and highly engaged part of the ecosystem. They cannot afford to make the wrong decision because they invest their money in these start-ups. They are also aware of the state-of-the-art mechanisms, platforms, contest and trends in consumer product start-up, and their vast network can potentially be a significant asset in this research.

Something significant to consider is that they have worked with both Designer Entrepreneurs and Non-Designer Entrepreneurs, so they are not predisposed to be a pro-design about this issue. Additionally, due to their experience, they can report actual behaviours, referred to their build knowledge and address comparison between designers and Non-Designer Entrepreneurs. They also can provide a historical view of how this ecosystem has been changing and what opportunities are arising. The investors in the study gave critical feedback about the

research and also gave clues about some areas of study. Their viewpoint adds legitimacy to the industrial need of this research. A side benefit of this interaction with this group as they showed interest in this study, validating the need to have research that shed some light into this topic.

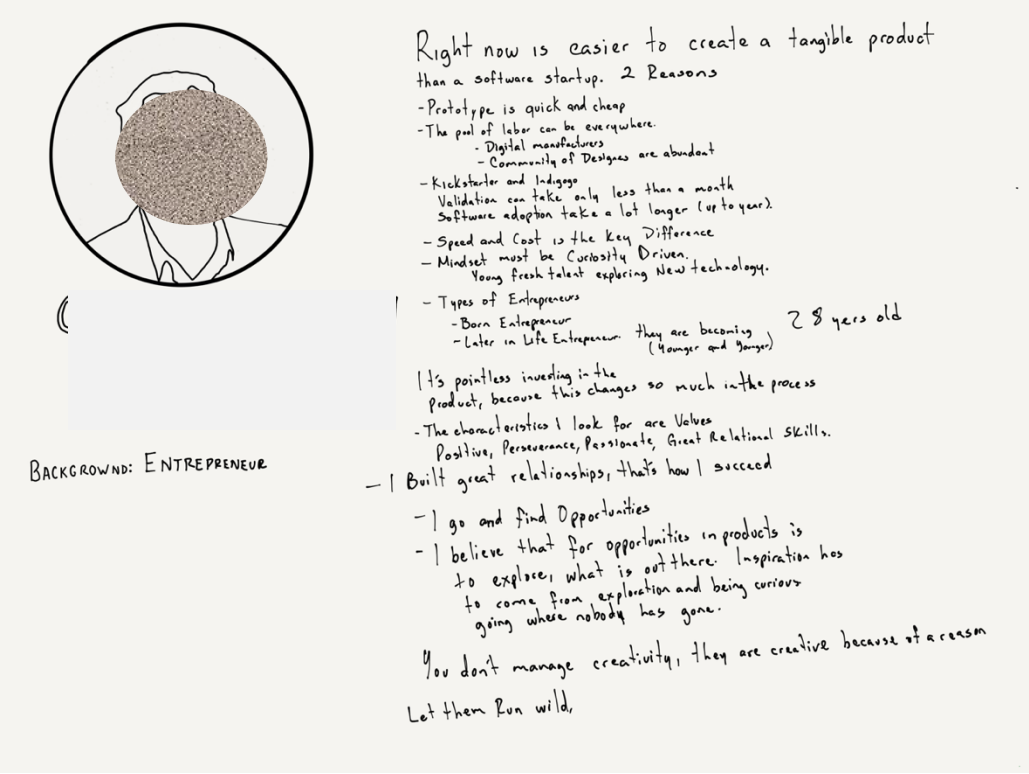


Figure 49. Examples of the memorandums taken during the interviews. Summary session sheet.

4.3.3 Business incubators & accelerators

These are businesses providing support, training and mentorship to entrepreneurs to start up a company. They have standardised procedures to reduce the risk of starting up a business. The reason why they are part of the study is that they are constantly adapting their methods to the new requirements. It can also be a vast pool for participants. The researcher needed to know their perspective and opinions.

This sector has many, first-hand experience with the development of new businesses, including some being established by Designer Entrepreneurs and some by other non-designers. The value of their input to the study was to discuss and begin to identify any observations about differences and similarities between these groups. They were also in an excellent position to broker introductions between the researcher and Designer Entrepreneurs for future interviews.

Nine business incubator/accelerators were identified and contacted in the North East region and, in some cases, initial meetings took place. The researcher also attended some public events on start-up, but none of them showed real interest to develop this investigation further.

The search was expanded to be UK-wide, and more than 400 business incubators and business accelerators were identified; three of them were focused on hardware, two of them in Industrial Design, seven in *IoT* (internet of things), seven of them in maker communities and ten in Medical Devices. The researcher reached out to these organisations, having the chance to present his investigation to five of them. Two organisation showed interest in the early stage of this research, sharing their thoughts and contacts to help this research. The rest of the organisations had no access to the adequate type of entrepreneur.

The hardware ecosystem and product ecosystem in the UK have been surpassed by the software or service-based business incubators and accelerators. In comparison with other places like Shenzhen, China, it is clear that the UK strategy for innovation has not been focusing on tangible products in recent years.

Cities like Shenzhen in China have a more vibrant scene in hardware start-ups due to the availability of specialised human capital and technological resources.

The following people (anonymised) were selected to be part of the study based on their relevance to the study, experience and interest in the topic.

Figure 50. Key business incubators & accelerators (Their names have been anonymised, please refer to Annex J for their description).

The study was expanded to other institutions where the researcher could find people interested in the topic. One of these places was the Design Council, which was running a program called Spark and is in charge of developing early-stage products and support them with mentorship and seed capital.

4.3.4 Industry insiders and platforms

Platforms such as Eventbrite and Meetup are used to broadcast events of specific topics and manage the attendees (figure 51). The researcher used this platform to seek out events related to design, innovation, product development and entrepreneurship across the UK.

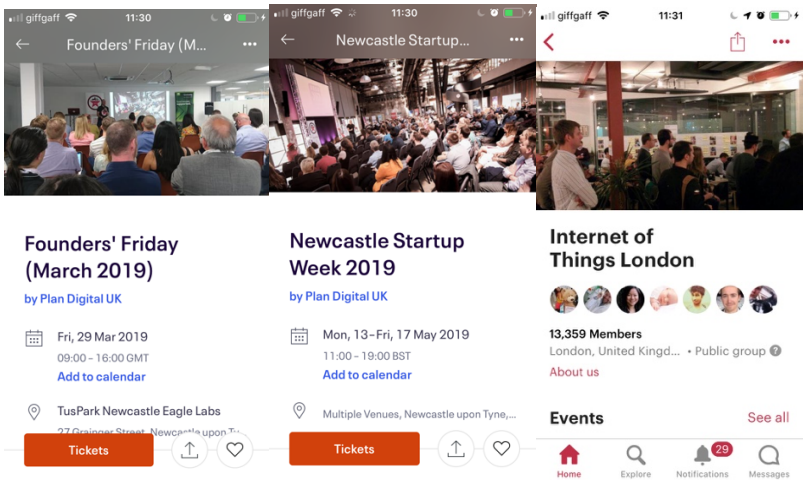


Figure 51. Left image: Eventbrite application; Right image: Meetup application. The researcher found potential participants in the events announced in these platforms.

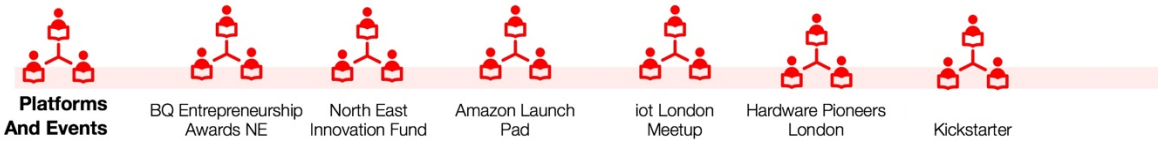


Figure 52. The key platforms and events.

Figure 52 shows the platforms in the study. These platforms are the ones that are enabling more Designer Entrepreneurs to start a company. The primary purpose of this approach was to track the new changes in the industry and also foreseen the short-term future in this area. It was also an excellent place to find potential participants for the study.

At the beginning of the study, this section was not considered to be part of the study, but it became clear that these are the platforms where amateurs and experienced members of the ecosystem interact for the first time. This approach explored the new trends in product development, what potential participants could be engaged and see the interest of the private sector in this field.

4.3.5 Non-Designer Entrepreneurs

This study needed some reference entrepreneurs to help contrast the findings from Designer Entrepreneurs. By doing so, the differences became more evident, and distinctions stood out. There were some pros and cons between these two groups. The participants within this group are working in a product-based start-up, developing tangible objects within the same ecosystem (figure 53).

Figure 53. The key Non-Designer Entrepreneurs (Their names have been anonymised, please refer to Annex J for their description).

These are entrepreneurs who don't have a background in design, but still, they are starting a consumer product start-up. The reason for including them is to have a point of comparison with entrepreneurs trained in design. Some entrepreneurs were interviewed during events and then, later on, asked to participate in a more in-depth conversation. Figure 54 shows the memo taken during the first interview.

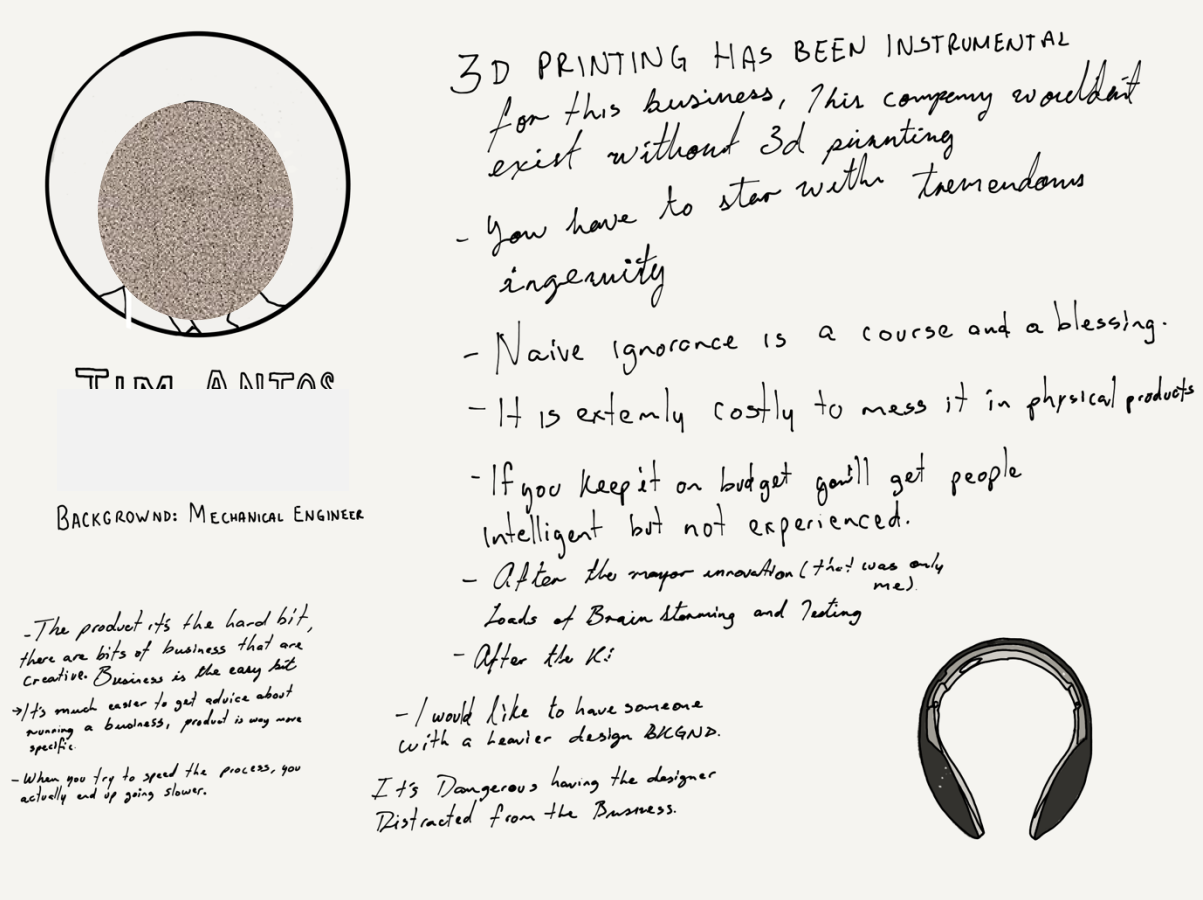


Figure 54. Memorandum of NDE-2 CEO and inventor.

4.3.6 Designers entrepreneurs

These are entrepreneurs who started up a business in a consumer product industry. The study will expose the transition from being designers and becoming entrepreneurs. It is essential to point out that they are the most difficult ones to recruit for the study.

The enquiry focused on the different milestones that no-designer follows, the creative problem solving and how they started up the company. This data might be used to contrast Designer Entrepreneurs.

Product entrepreneurs turned out to be the most challenging type of participant for this study. A careful selection of business incubators and events targeted to product designers and entrepreneurs was made, to liaise with relevant participants to the study. Also, multiple channels of communications were used by the researcher to get in contact with designer entrepreneurs. In addition, desk research on designer entrepreneurs in the UK was made, bringing up important

names to this research. Figure 55 shows an example of the LinkedIn invitation sent to the entrepreneurs.

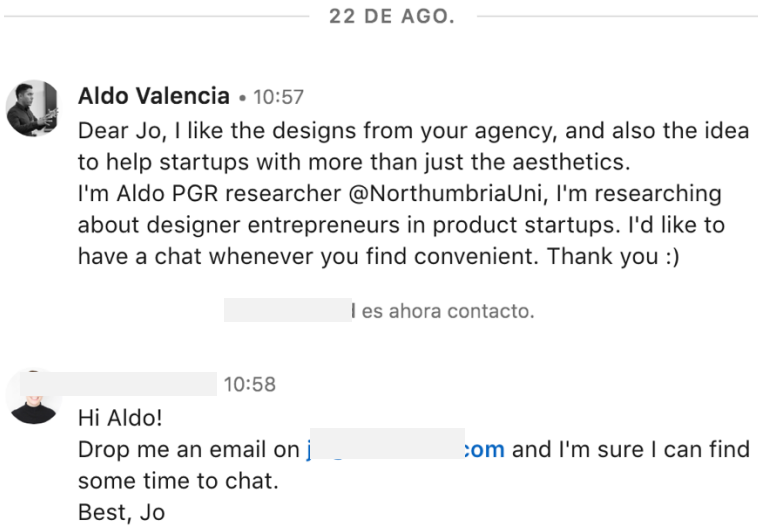


Figure 55. Sample of the introductory message sent to Designer Entrepreneurs found online.

This is the most critical group of the study, shown in figure 56. The criteria of selection consist of designers who started their own product-based company. The product has to be manufactured in scale to avoid having crafts and art pieces.

Figure 56. The key Designer Entrepreneurs (Their names have been anonymised, please refer to Annex J for their description).

The enquiry focused on the transition the Designer Entrepreneurs took from idea to market, their challenges and their learnings of becoming an entrepreneur. Figure 57 shows the memo taken during the interview.

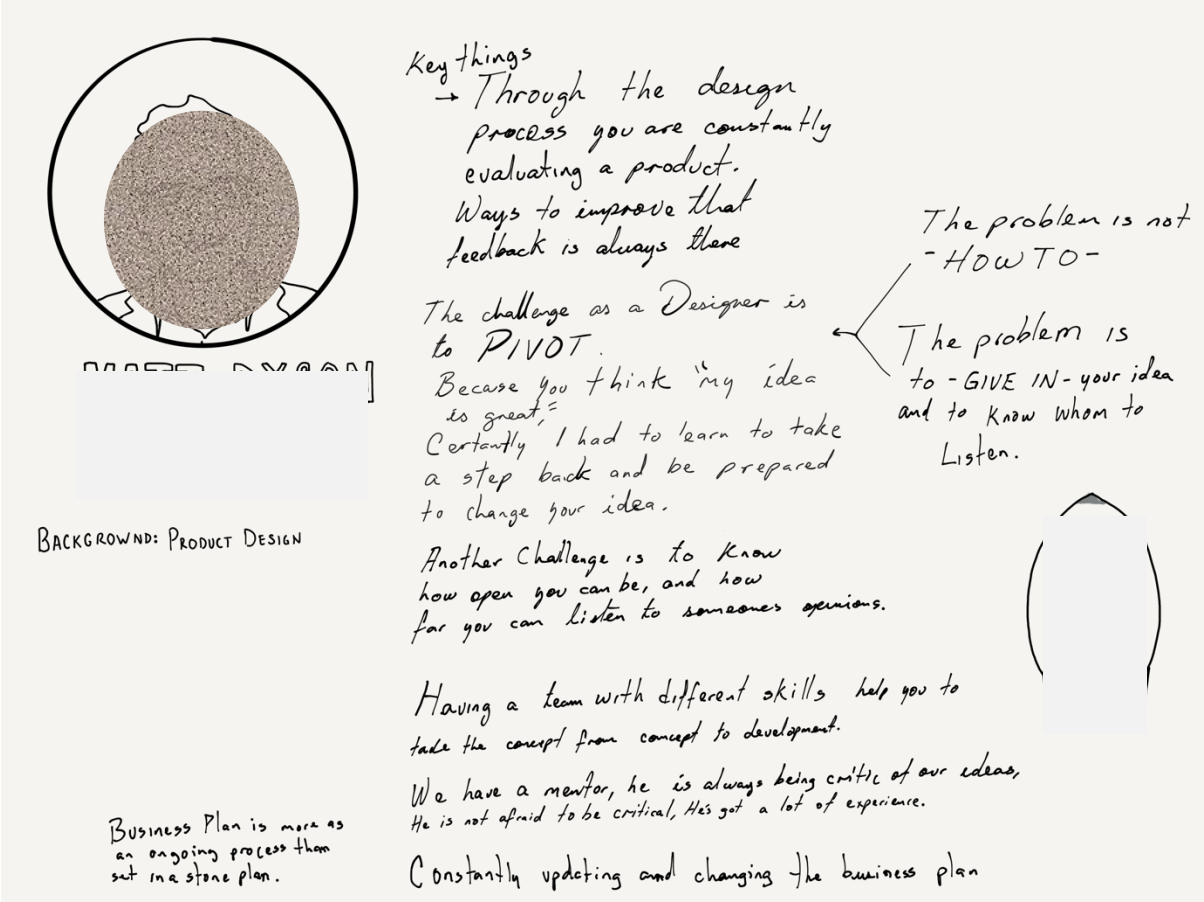


Figure 57. Memorandum of the first interview with DE-3.

4.4 Data coding and analysis of Phase One

As seen in chapter 2.14, CGT recommend the collection of data and its simultaneous analysis before finishing collecting the whole sample, thus enabling the process of conceptualisation of the phenomena.

The recorded audios from multiple interviews were 46 hrs in total. There were periods in time where the researcher utilised his time to analyse the data collected while other participants accepted to enter the study. This parallel process optimised the time and resources of the researcher, and concurrently the conceptualisation of the phenomena became more robust. This conceptualisation brings new questions and reflections to the interviews, making them more dynamic and reflecting the learnings that the researcher accumulated after each interview.

The transcription of the data and the cleaning process of the data happened simultaneously. NVivo V.12 was selected as the tool to use for coding the interviews. The selected method was inductive analysis to allow the multiple participants to add new perspectives to the study without

imposing the researchers' point of view. As seen in chapter 4.2, this emergent coding of Phase One data collection helped the investigator to understand the context and the nuances between the ecosystem and Designer Entrepreneurs. Figure 58 shows the coding process in NVivo.

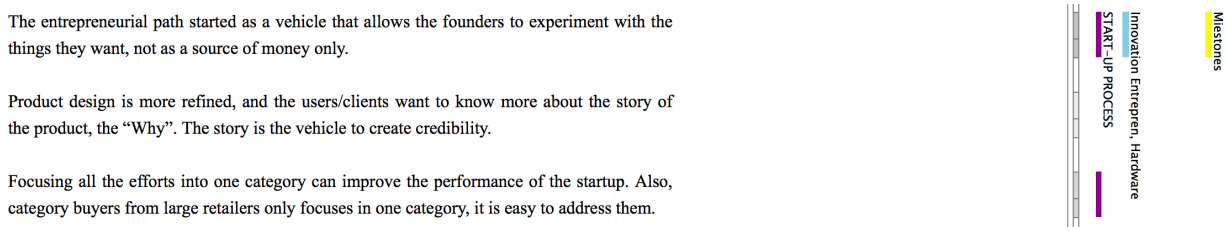


Figure 58. Emergent coding in NVivo. The researcher used an inductive approach to let the data speak for itself.

After transcribing and coding the first batch of interviews, tentative themes and questions emerged from the data collected. The comments and opinions of the experts and members of the ecosystem identified several gaps in the researchers understanding of the issue (as it is shown in Annex D), making a case for the second round of interviews with more specific questions addressed directly to Designer Entrepreneurs. By addressing this one group in particular, the study can then begin to focus on unveiling new insights of Designer Entrepreneurs.

The coding process honed the query and added concepts not considered in the DECPI typology constructed in Chapter 1.

A considerable number of insights were extracted from the Phase One data collection (Shown in Annex D. Some questions required a further investigation on the issue but to narrow down the study, the researcher concentrate on the insights he found pertinent to expand the reach of this research. The tentative themes emerged in this phase are shown in figure 59.

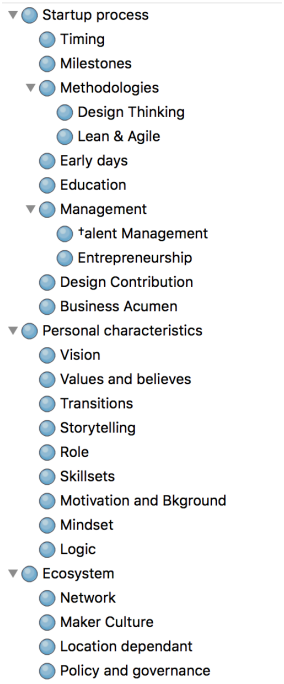


Figure 59. Tentative categories of the Phase One data collection.

4.5 Phase One data collection insights

4.5.1 Findings Phase One Data collection

This section compiles the insights generated in the Phase One data collection. They have been organized according to their group´s source. These insights were under scrutiny to find potential leads that can take this study one step forward. Constructivist grounded theorist need to identify what is most significant to the participants to be able to carry on with the study.

The result of this Phase One data collection will support the construction of the final enquiry targeted exclusively to Designer Entrepreneurs. This Phase One provided the study rich information about the context and the collective understanding of the issue.

In the following lines, there are examples of insights of each group and they are followed by the questions that arise from these insights. In Annex D, a detailed table of insights, and further questions on each group can be found.

4.5.2 Examples of insights from Academic Experts in Design and Entrepreneurship

4.5.2.1 Entrepreneurial education

Based on the expert's opinion, entrepreneurial education has been focused on theory and not about being action orientated. This means that problem-solving skills are rooted in the entrepreneurs' mindset, but over qualification can diminish this potential by turning people into an analyst instead of an actor. Innovation is finding a new way of doing things; there is no manual or previous theory that shows people exactly how to do it. Therefore, academic performance cannot predict the business performance of individuals. One overlap between design and entrepreneurship is that they both are learnt by doing. People can read the book on "How to juggle", but that is not going to teach them how to be a good juggler. Design thinking should come along with design-making. Innovation is a social process; it is not an act in isolation.

Examples of the questions to expand the understanding of this issue are:

Is design education bringing up the student with this balance between practice and theory?

Could design serve as the balance between practice and theory by adding its action-oriented approach?

How can someone become a Designer Entrepreneur?

4.5.2.2 The meaning for entrepreneurs

We can assume that the products created by start-ups contain a major dose of meaning since the entrepreneur is closer to each decision, leaving their imprint onto it. Insights come from observing while meaning comes from reflection. The interpretation of "Reality" comes with reflection. It is a different way of seeing problems. It is not what everyone believes they know. Reflection leads entrepreneurs to a different path in innovation.

Example of the question to expand the understanding of this issue is:

Are Designer Entrepreneurs more effective to listen, translate, synthesize and deliver meaning through their objects?

4.5.2.3 Design and entrepreneurship

Designers tend to be very driven by creating the design solution, and that is not what entrepreneurship is about. Entrepreneurship is about creating a sustainable business and a business that makes a profit. Sometimes designers maybe are too focused on the design solution and less on the business solution albeit both are very important.

The design discipline comes from the art tradition in many schools across the UK. Sound artists, the ones that are remembered now, learnt how to sell their work, or they found patrons who were giving them money. They produced much artwork. The purer the skill in an individual (scientist, designer) the more remote to entrepreneurship or commercial skills they are "Purist" Designers have a false expectation of the importance of their product and do not have the empathy or the vision why anybody else wants to pay for this thing they are inventing.

Examples of the questions to expand the understanding of this issue are:

What are the pros and cons of focusing on the product?

Is that because of the lack of business acumen or because there is "not good enough" perception about the product?

4.5.2.4 Designers transition

The transition from being a designer to becoming an entrepreneur might make designers more confident about investing and more confident about assessing opportunities. They are actively looking for ways to mitigate that risk. A big misconception is that entrepreneurs are risk-takers, but in reality, they need to de-risk everything.

Examples of the questions to expand the understanding of this issue are:

How can design contribute to de-risk things in a start-up?

Are designers risk takers or risk avoiders?

4.5.3 Examples of insights from Investors in Product Design

4.5.3.1 How designers communicate to investors

The pitch of Design start-ups and Tech start-ups is different. Product start-ups do not talk the language investors are used to hearing. It is not about valuation; it is not formulaic. They are focused on selling the product, and speaking to the regular customer, in his language. They are driven by putting their product on the hand of the customer. It is about bringing revenue since day one, that makes them more active, aligned with value generation in their business. Tech start-ups are very number-driven, always thinking about the exit strategy and they talk the investor's language.

Examples of the questions to expand the understanding of this issue are:

What is the perception that investors have about designer´s pitches?

What is the perception that customers have about this designer´s pitches?

How do crowd-funding platforms react to this way of pitching designers have?

4.5.3.2 Differences between product start-ups and the rest.

Software developers in start-ups communicate with each other in the same language. That reduced the complexity of the development process. In a hardware start-up, there is a pile of different design elements. They do not talk the same language, and there are few standard tools between each other. The design outcomes depend on your team. Each team needs a diversity of thinking, to honestly think out of the box.

Examples of the questions to expand the understanding of this issue are:

How multiple disciplines can build bridges to develop tangible products? (electronics, plastics, structure, software, etc.).

How divergent can you be when you have investors on your back asking for tangible progress?

Are there any pros/cons of having multidiscipline in your team?

4.5.3.3 On the experience in entrepreneurs

Entrepreneurs have to leave their experience at the door because it might leave them jaded. Tenacity is more important than experience. Experience is about timing, just because it did not work five years ago does not mean it should not work today. If you got the right team and the financing, everything could work if the timing is right. Conversely, it does not matter if your team or the financing is right, but the timing is wrong; it's going to fail.

Examples of the questions to expand the understanding of this issue are:

What can designer tools help you to find out the perfect timing?

If experience makes you jaded, would you trust in a novice? What areas of the start-up require sufficient expertise?

4.5.4 Examples of insights from Business Incubators and Accelerators

4.5.4.1 On available methodologies

Nowadays it is possible to have methodologies such as *Agile* (2001) and *Sprints* (2010) because it is possible to set up a company in few days and fly to Shenzhen, China, to develop things in a fraction of what it used to take before. There are multiple authors with methodologies for goal settings, but they are addressing the same process.

Examples of the questions to expand the understanding of this issue are:

Is the speed the main advantage of these methodologies?

What can designers learn from those methodologies?

4.5.4.2 The falling cost of manufacturing

China is more interconnected with the world, which allows everyone to have access to its manufacturing power and speed of development. There is the idea that today, it is cheaper to set up a company, but in reality, it is not. There is another cost involved; the cost moved from manufacturing to digital marketing and data analysis.

Examples of the questions to expand the understanding of this issue are:

What is the implication for new product development and setting up a business?

The advantages are clear, are there any disadvantages?

4.5.5 Examples of insights from Platforms and Events

4.5.5.3 Amount of production

The ecosystem has influenced the aspiration of industrial designers. Previously, designer's inventions could see the light through a manufacturing partner after licensing the product to it; or working their way up in a design studio that allows them to work on their ideas. Whereas now, it is easier to manufacture small batches of your product, test it and then to get the big manufactures or seed investment to grow big.

Examples of the questions to expand the understanding of this issue are:

What has the industry experienced by this new wave of designers?

What are their capabilities and their limitations?

4.5.5.4 The role of stories in the product´s identity

It is essential to have a story behind the product and the company to sell tangible things before making them real. The story builds empathy and trust. They have confidence that the company can deliver what has promised. Crowdfunding websites are mostly a storytelling platform and are not about selling the product. It is inviting people into the story behind it, and include them into the process. Those become the early adopters, early users who backed up the campaign.

Examples of the questions to expand the understanding of this issue are:

How can Designers use their visual skills to make stories more compelling?

Is there any evidence of how designers export the stories made to conceptualize into the marketing of the product?

What elements do stories have to address in order to connect with people?

4.5.5.5 Hands-on personalities

Inventors, makers, designers and entrepreneurs share their interest in building things and creating new objects. However, there vary on the purpose that had before building the product. Inventors stretch out the technical capabilities in their field. Makers like to try out new things for the first time, designers materialise their concepts having a potential user in hand systematically and lastly, entrepreneurs build the platform and the product to reach a consumer.

Examples of the questions to expand the understanding of this issue are:

Can we say that the intersection between design and entrepreneurship is building something with a user/consumer in mind?

4.5.6 Examples of insights from Designer Entrepreneurs

4.5.6.1 Reasons why designers started their company

In some cases, the entrepreneurial path started as a vehicle that allows the founders to experiment with the things they want, not as a source of money only. Entrepreneurs have to be good at building the product and the business at the same time. The difference between designers and entrepreneurs is the conviction to take the idea through, from concept to production. Personal timing is critical (but this might apply to all the entrepreneurs).

Examples of the questions to expand the understanding of this issue are:

Why are so many designers with great ideas and thus, fewer Designer Entrepreneurs?

Whether testing out ideas is more important than making a profit out of them?

4.5.6.2 Contest and design competitions

The importance of participating in the contest is crucial. They gave start-ups exposure, free press, mentorship, funds, product feedback, access to expertise and networking. To get confidence, it was essential to receive criticism on an early stage. Criticism is seen as advantageous.

Examples of the questions to expand the understanding of this issue are:

Who did they ask for criticism?

Is that part of the benefits of contest?

4.5.7 Examples of insights from Non-Designer Entrepreneurs

4.5.7.1 The early stages of a company

The first thing after coming up with the idea is to search for is the size of the market and the business opportunity of it. The first step is to understand the market, the needs and the business case. A business case goes before building the prototype.

Examples of the questions to expand the understanding of this issue are:

Does this only work for a market driven approach?

Or tech push or design driven innovation?

4.5.7.2 Skillset and practical knowledge

A quick self-assessment of the skills and capabilities showed the need to ask for external help.

The entrepreneurs could outsource the task where their skills were not on a good level.

Pay for experts, do not try to learn new areas; it might be much cheaper at the end.

Examples of the questions to expand the understanding of this issue are:

How can you benefit from learning more about it?

Does that save money down the line?

A full list of the insights collected on Phase One data collection among the questions arose from them can be found in Annex A, B and C..

4.6 Construction of the interview model for Phase Two data collection.

The following stage (Phase Two data collection) required an interview model that could go further in the selected themes to develop the knowledge on the topic.

The interview model needed the evaluation of which questions were more critical, which others could be answered with a literature review and which others would not contribute to answering the research question.

The next section explains how the interview model for Phase Two data collection was generated. The previous list of questions was coded using NVivo to help the researcher come up with the new relevant themes. The list of all the questions arose during Phase One data collection can be found in Annex B.

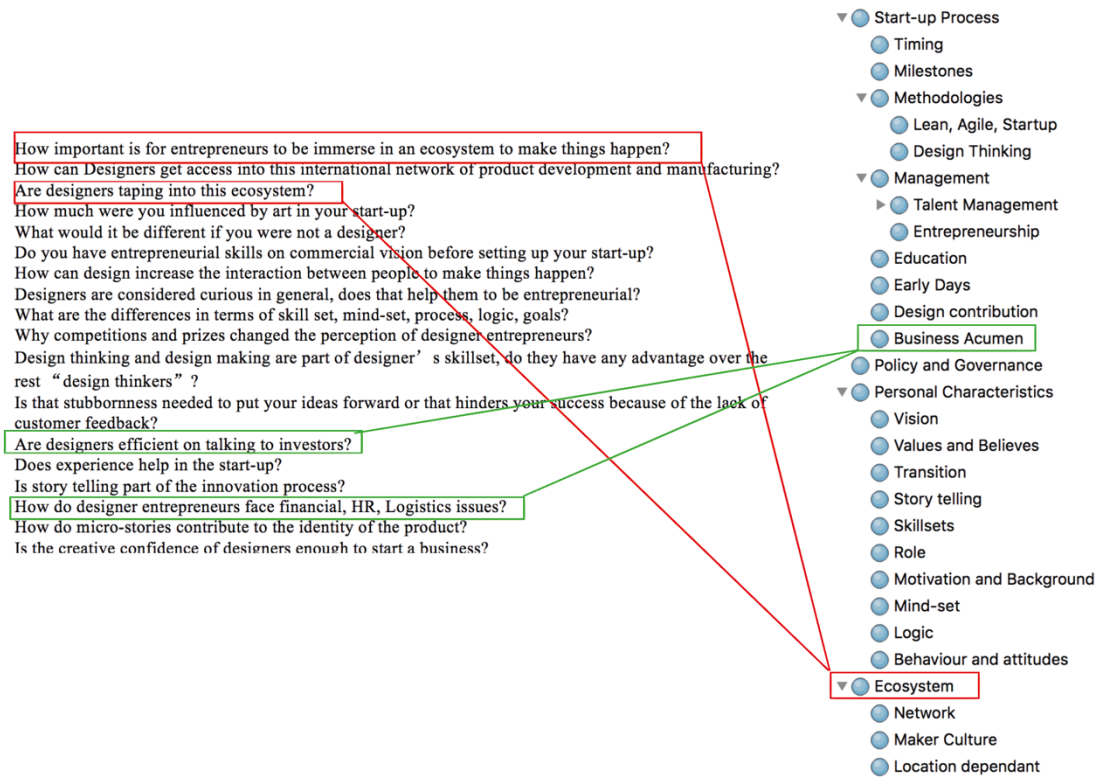


Figure 60. Snapshot of the generation of the themes in NVivo. On the left-hand side, a sample of the questions that arose in Phase One data collection forming the nodes of the tree-diagram (the right-hand side).

The generation of different themes for potential further exploration in Phase Two data collection required a codification of the available data, as seen on figure 60. The tables in section 7.2 are examples of how the themes for Phase Two data collection came up.

4.6.1 Examples of theme generation for the interview model

The following tables (9, 10, 11, 12 and 13) show five examples of nodes and their respective questions, followed by a proposed question to expand the inquiry to the next phase of data collection. Some themes were taken to continue the enquiry and some others dismissed, due to their pertinence to the topic and the researcher's interest.

4.6.2 Storytelling theme

The communication skills of the entrepreneur were referred by some participants, also indicating that designers can communicate their ideas visually. Potentially, this might be an area to explore in this study.

Table 9. Theme for potential further exploration: Storytelling

Theme	Category	Enquiry for the next phase
Storytelling is part of the innovation process	Storytelling as a key asset in a start-up	How did you use the story of the product and the start-up? Was there any benefit to tell the story?
Micro-stories contribute to the identity of the product		
Evidence of how designers use the stories for the marketing of the product		
The micro stories shared are related to the product or the team		
Designer's style this pitch is different to business savvy entrepreneurs.		
Empathy and credibility are elements of the story and the pitch.		
Crowdfunding platforms react to the way of pitching designers have.		

4.6.3 Start-up journey - Milestones theme.

The theory about new product development, innovation, business creation and start-ups methodologies do not cover how designers start businesses in consumer product industries. Therefore, the need to understand the milestones of the entrepreneurship taken by Designer Entrepreneurs in the current conditions of the ecosystem was essential.

Table 10. Theme for potential further exploration: Start-up journey – Milestones.

Theme	Category	Enquiry for the next phase
Milestones of a product-based start-up	Start-up Journey Milestones	What is the sequence of decisions and events DE faced to take the product
Scenarios are part of the roadmap for start-up´s business decisions.		
There are not fixed sequences to develop the product and the company		

Regrets of the entrepreneurial journey		from idea to launch?
The first steps made by Designer Entrepreneurs		
Time to go from idea to market		
Co-creation is not part of the product life cycle		
Product development do not stop with designers' entrepreneurs.		
The importance of design and product contest in the start-up journey.		

4.6.4 The early days' theme

The product development process and the entrepreneurial journey start from the same place, an event that triggers the idea of a product/business. This theme encompasses the beginning of the entrepreneurial journey, trying to find out more about the designers' spark.

Table 11. Theme for potential further exploration: early days

Theme	**Category**	**Enquiry for the next phase**
Reason why Designers start-up their company	Early days	What made you start your business? What was different about this idea to the rest you had? And What made you realized this was worthwhile trying?
Primary options of career development that designers have before starting the entrepreneurial path		
The breaking point to stop being an employee to becoming an entrepreneur?		
How did you come up with the idea?		
The motivation behind entrepreneurs		

4.6.5 Business acumen theme

Design and business disciplines have overlapping interest in marketing, innovation awareness among others. However, there might be specific areas where Designer Entrepreneurs need more support.

Table 12. Theme for further potential exploration: Business Acumen

Theme	Category	Enquiry for the next phase
Way to speed up the learning curve in Design/ Entrepreneurship	Business Acumen	If you had to start again, what would you do differently from the business side? What are the 3 business acumen nuggets you would like to tell yourself if you could go back to the very beginning?
Entrepreneurial Scenarios		
Designers learnings on business thinking		
Metrics that designers use to measure their start-up performance		
Business acumen for designers		
Did you follow your business model?		
Ways entrepreneurs utilize to predict commercial success.		
Designs' KPIs in a start-up		

4.6.6 Talent management theme

The nature of start-ups is to work in creative areas. From high-tech to social areas, they attract highly talented people on board. There is a need to understand how designers manage talented people in a highly creative environment.

Table 13. Theme for potential further exploration: Talent Management.

Theme	Category	Enquiry for the next phase
Designer Entrepreneurs facing HR issues	Talent Management	How do designers manage their team? How flexible can designers be when there are multiple activities to execute?
Designer's strategies to effectively communicate to the rest of the team		
Benefits and drawbacks of having in-house designers		
Benefits and drawbacks of having a designer founder		
Main tasks performed by designers in a start-up		

4.6.7 Tentative theoretical categories

As seen in chapter 2.14, CGT relies on tentative categories to inform the following data needed in the study, how to collect it, and who need to be involved. The final category-tree is as shown in the following table.

Table 14. Tentative Categories.

Tentative Category	Theme	Sub-theme
Start-up process		
	Timing	
	Milestones	
	Methodologies	
		Design thinking
		Lean & Agile
	Early days	
	Education	
	Management	
		Talent management
		Entrepreneurship
	Design contribution	
	Business Acumen	
Personal characteristics		
	Vision	
	Values and believes	
	Transitions	
	Storytelling	
	Skillsets	
	Role	
	Motivation and background	
	Mind-set	
	Logic	
	Behaviours and attitudes	
Ecosystem		
	Network	
	Maker Culture	
	Location dependent	
Policy and governance		Policy and governance

**The selected themes for the interview model are underlined in this table

Another way to visualize the themes is displayed in the figure 61.

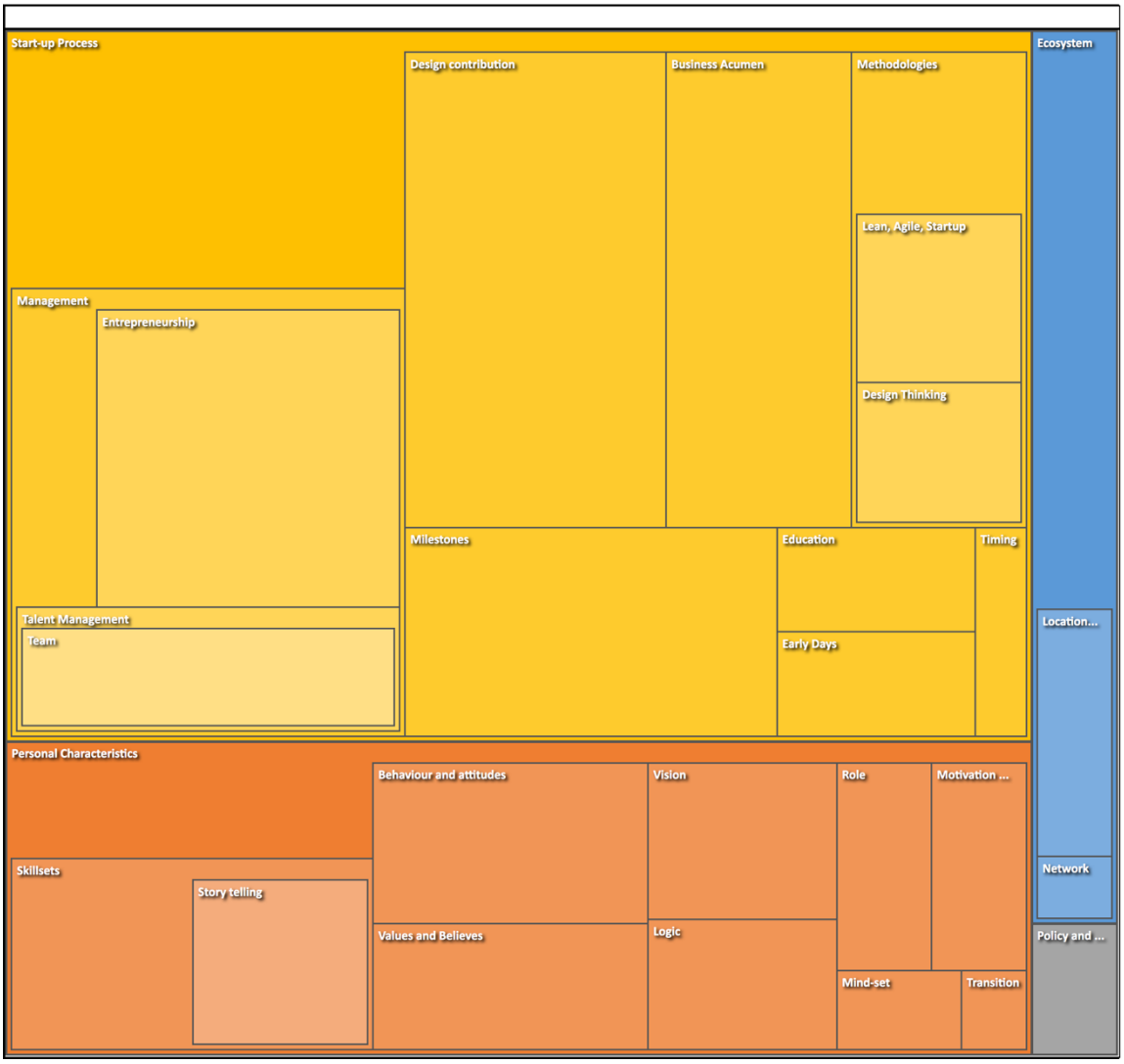


Figure 61. Automatic visualization produced in NVivo 12. It deploys the themes generated from Phase One data collection.

These embedded rectangles represent the hierarchy of the nodes, depending on the number of questions placed inside each node. **It is just a representation to visualize the recurrence of the themes.**

CGT toggles between analysis and data collection, enabling the conceptualization of the phenomena. This approach shapes the type of data needed in the study and how and when to collect it. To do so, GT uses "tentative theoretical categories to inform subsequent data collection" (Charmaz, 2011). This means that these tentative categories will be the base for the successive study.

4.6.8 Structure of the Phase Two data collection - interview model part 1.

The interview model requires precision and efficiency to collect insightful information from Designer Entrepreneurs. It must allow participants to build the narrative chronologically, starting from the facts, warming up the conversation to get the reflections at the end of it. Ferris (2016) suggested that to get the most out of an interview, the interviewer have to start asking the facts, which are easy to remember and do not require reflection. This helps the participant to recognize in which direction the interview is heading. This also builds rapport and gain trust with each other; then, this can lead the interviewee to the questions that require more reflection, attention and honesty. The flow of the interview model will follow this approach, starting with the things that are easy to remember in a chronological way, leaving the reflections at the end of the interview model.

Table 15. Enquiry for the Phase Two data collection. Themes and questions to be included in the interview model for Designer Entrepreneurs.

Theme	**Questions to expand and deepen the knowledge**
Background	Before you got involved in the current business, can you tell me about your previous experience?
Early days	Please can you think back to very beginning of the business? What were you doing at the time and where did the idea come from?
	What made you decide this idea was more than a simple prototype?
	Tell me about the other cofounders, and how they contributed to the start-up? Describe their backgrounds?
	At the very beginning, what resources did you have at hand?
	For example, were there particular contacts that you already had that were useful at this stage
	Again, thinking about the very beginning, what resources did you have at hand, in terms of access to facilities or technologies?
The start-up processes	When you got the company started, would you describe your company´s strategy as Human-Centred or Technology Driven or Market Driven?
	Explain how you know that?

	When you got the company started, what was your involvement with the business side of the start-up?
	Did you have a feel for how the business would make money?
	What was your role in the business-planning process?
	What was your role in shaping the business model?
	Can you tell me about any experience in a design/business competition that you have participated in?
	If I sent you back to back to the beginning of this start-up process, but give three additional areas of expertise, which ones would have really helped? Aesthetics, Styling, Decoration, Interaction, User-cantered, Ergonomics, Mechanical engineering, Electrical engineering, Industrial engineering Material sciences, Environment, Pricing, Distribution, Brand, Management, Finances, Intellectual, Property, Sales.
	Please explain why those would have been so helpful to you?
Working with other disciplines	Can you think of a time when you had to compromise on the qualities you really wanted in the product because of others pressures (such as production cost, manufacturing, marketing or finances)?
	Was this a recurring problem or a one-off?
	What did you do to sort this out?
	Were any occasions where your cofounders or stakeholders wanted you to change something in the product that you weren't sure about?
	Do you think your original design ambitions were achieved in the final products?
Reflections	Can you think back to one moment when you thought the business could really fail?
	What was going wrong?
	Tell me more about what happened?

	How did you decide what to do?
	Would your co-founders see this potential failure-point in the same way?
	What do you think would have turned out differently if you weren't a designer?

4.7 Visual summary

The study produced three diagrams that summarize the process in Phase One data collection. The findings will be discussed in the following section.

- Figure 62 shows the chronology of the interviews conducted by the researcher,
- Figure 63 shows the visual map expanded. The knowledge generated in this chapter/section gave the researcher insights on Design Entrepreneurship issues and potential opportunities to expand the study. This map shows the results of the Phase One data collection.
- Figure 64 shows the snowball effect in this study. This study is mainly focused on England's ecosystem. Thus, the researcher had to start from scratch to build up the network, which potentially can provide with the participants, feedback and knowledge to address the research question of this investigation. The following diagram portrays the sequence of contacts the researcher got access to, after using the snowball technique and professional events platforms such as Meetup, Eventbrite and LinkedIn.
- Figure 65 shows the Road map of Phase One. The interviews completed in this stage of the study involved all the relevant stakeholders the researcher could grab on. Each one of them provided insights and perspectives that led the investigation to the next level. The summary of the interviews that served as a basis to craft the final version of this research is presented below. The participants and their track can be seen in the following diagram.

4.7.1 Chronology of the Phase One data collection

This phase started at the beginning of the study, in October 2016, and concluded in March 2019. More than 30 participants from 10 different nationalities got involved at this stage. This study tries to describe the situation of UK entrepreneurs. However, the ecosystem and innovation practices are standard in many European countries and North America.

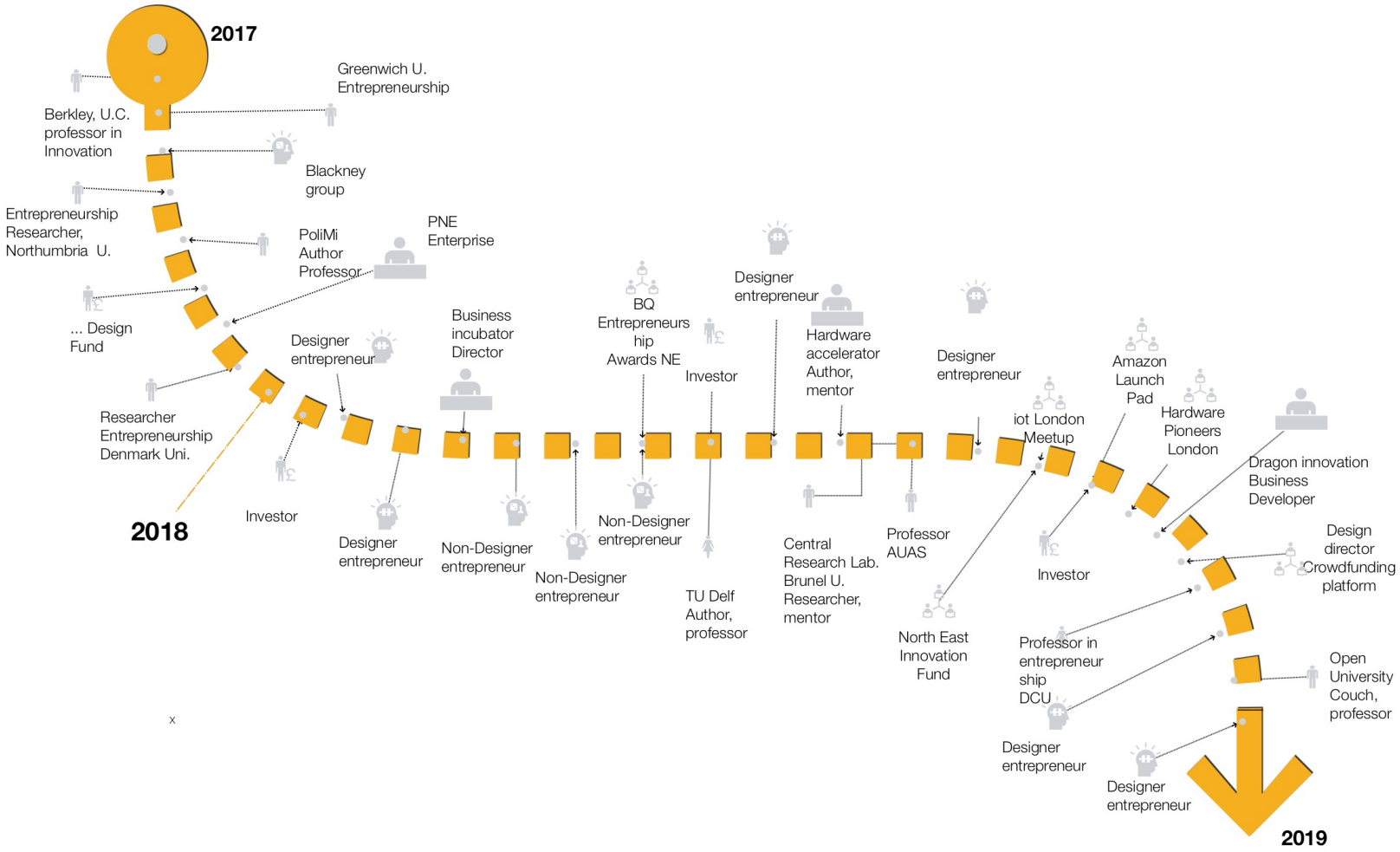


Figure 62. Chronology of the interview process.

Figure 63. Expanded map including the feedback and ideas taken from the discussions with academics and practitioners in the fields of Design and Business.

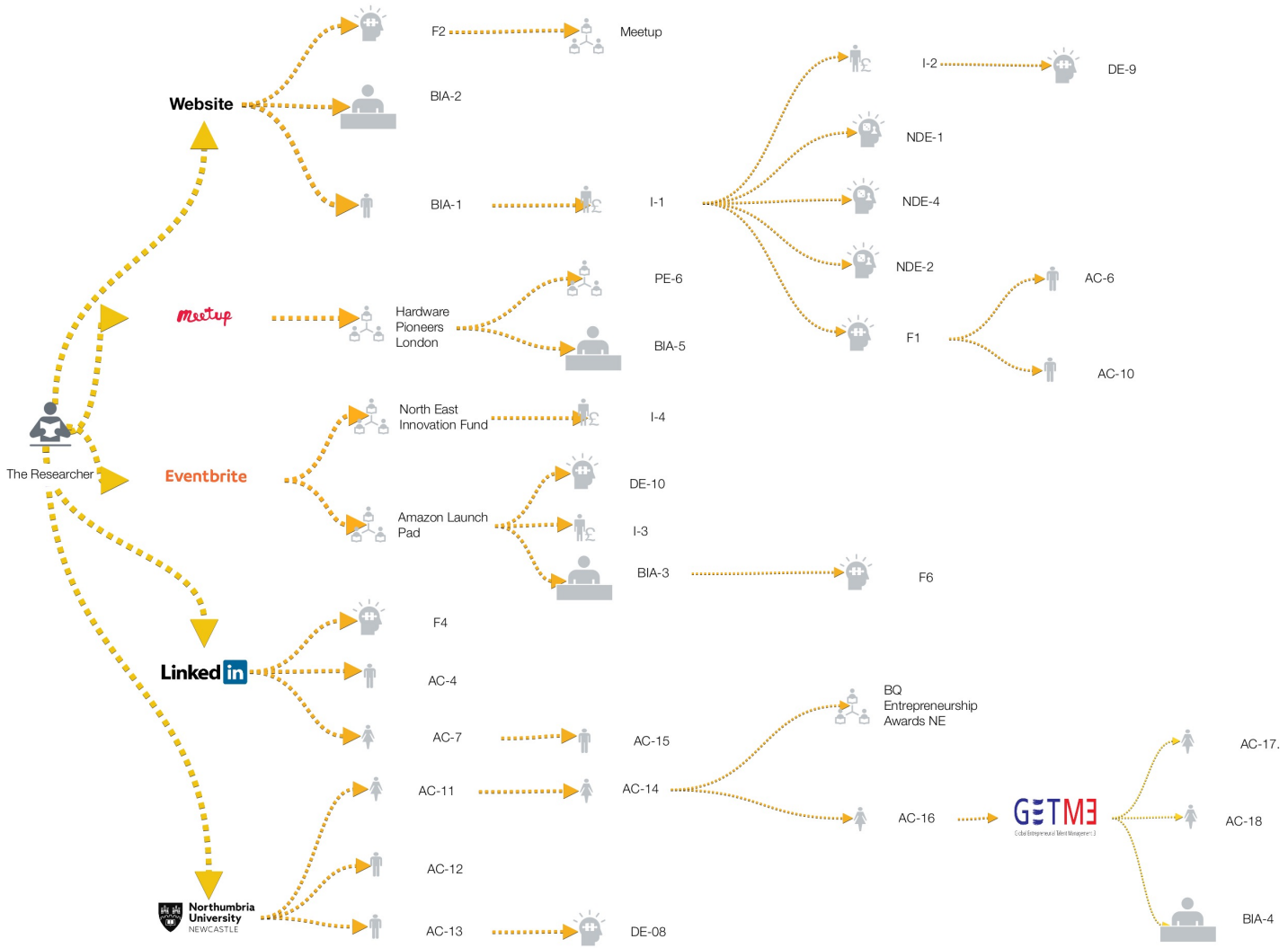


Figure 64. Summary of the Snowball effect in this study. Please refer to Annex J for a brief description of each participant.

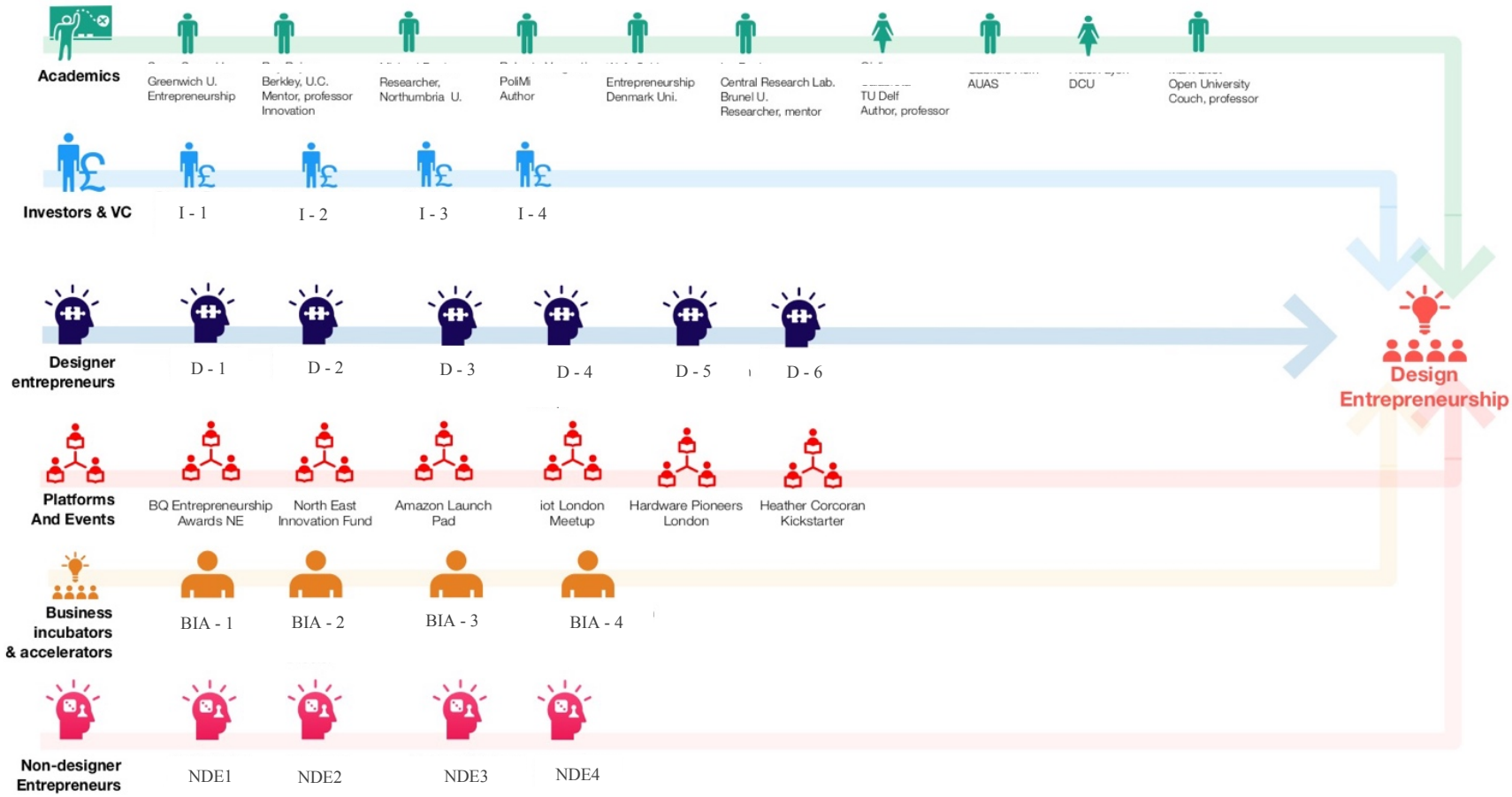


Figure 65. Data has been collected from these participants.

4.8 Introduction to Phase Two data collection

This chapter describes the Phase Two data collection. This second round of interviews targeted specifically Designer Entrepreneurs, provided interesting remarks in multiple directions, addressing topics such as technology, attitudes and behaviours, processes, mindsets, disciplinary values, management and personal transition.

The iterative approach followed in Phase One data collection favoured the construction of the interview model used in Phase Two data collection. In Phase One, investors, academics, platforms, incubators & accelerators, non-designer and Designer Entrepreneurs were interviewed to gain an understanding of the current situation of the ecosystem to grasp an overarching view of the issue. In Phase Two, the study narrowed down its scope concentrating on Designer Entrepreneurs and their transition, from being designers and becoming entrepreneurs.

The data obtained in the previous chapter suggested that there is a sense of authorship that drive designers towards building personal-driven products, regardless of whether the market or the technology had been proven before.

4.8.1 Phase Two data collection: Designer Entrepreneurs

The interview model developed in the previous stage explored five main areas: The background of the entrepreneur, the early days of the start-up, the process he or she went through to set up the company and develop the product, the multidisciplinary work & how they managed it and their reflections of the start-up journey. A set of interview activities were developed to retrieve the designer´s experiences and reflections, portraying a sequence of milestones taken during this stage. These milestones consider the range of possible steps described by the leading consultancies in new product development and start-ups accelerators as well as academic references (PCH international, 2018; HAX, 2018; frog design, 2017; Ulrich and Eppinger, 2016).

4.8.1.1 Imagery for the inquiry of the study

Learnings from the early Phase One interviews showed that the entrepreneurs needed to recap from time to time and check the sequence of activities. Several studies have shown individuals recalling autobiographical events or actions performed might evoke distorted or fake memories of those events (Loftus & Pickrell, 1995; Thomas & Loftus, 2002). This is known as imagination inflation. These false memories happen when the individuals remember something

inaccurately. Using imagery is an effective way to improve memory and decrease false memories (Oliver et al., 2016).

4.8.1.2 Activity one

A sheet with a set of images representing each of the possible milestones taken by the entrepreneur was given to Phase Two participants. The imagery enables the participants to connect the concepts with a line (a chronological line), helping them to retrieve/recall and verbalise their experiences at that moment.

In this activity, the Designer Entrepreneur would verbalise the path they took from the very beginning of their start-up, and through each subsequent activity. This process asks the participant to think aloud while performing a specific task, pausing the action at any time and permitting asking questions at any point during the process. This is also known as Think-aloud technique.

At the same time, the Designer Entrepreneur is asked to connect a set of images in a chronological sequence. The images represent the milestones Designer Entrepreneur followed while they were developing their product and establishing the start-up. The Designer Entrepreneur can share as much information as they can, whatever they did, tools used, experts they got involved in the process and how they felt as they went about developing the product and the start-up.

The interviewee will build the narrative while he recalls the sequence of events, drawing a linear chronology from idea to launch connecting the milestones of the entrepreneurial process they have followed.

By doing this, designer-entrepreneurs will retrieve information visually of the events related to the market, the funding, the validation of the concept, production and development, prototype and product feedback. It will also ask about if and when significant changes of direction/priorities happened known in entrepreneurship literature as 'pivots'. (The main body of questions is integrated below).

This think-aloud protocol aided by visual iconography will provide insight into how designers went from the idea to launch. This is a visual approach to sense-making rather than a word-based approach to sense-making (Refer to figure 40 in Chapter 4). By doing so, Entrepreneurs can rely on the visual images to draw a continuous line across each milestone, retrieving information and events during those periods.

4.8.1.3 Timeline of milestones and events

Once the timeline of the milestones is created, the potential challenges/failures, and the explanation of the process is transcribed. Each stage will be analysed with the help of a proprietary framework (Designer-Entrepreneur framework). The idea behind this framework is not to anticipate possible results, but to be ready to perceive the pieces of information that are still not yet described by the current literature. This framework contains the most recent theories of Design and Entrepreneurship. Patterns, nodes and processes, values, mindsets and beliefs will come out from the analysis.

4.8.1.4 Activity 2

The second activity presents the common reasons why start-ups fail (based on the literature review in Chapter 2). The participant designers are asked to write down and then discuss those problems they had encountered in their business and how they have overcome them. This activity has been designed to identify the most significant challenges they faced in this process and how they tackled them. In this activity, figure 66, some of the reasons new companies and start-ups fail are discussed. From the list shown on the handout, the Designer Entrepreneur is asked to identify three significant obstacles they encountered during the start-up process of their business. This activity is expected to provoke reflections from the Designer Entrepreneur on the milestones and the challenges he or she has faced. On the left side of the image below, there is the map developed with the possible milestones along the journey from idea to market while on the right side, there is the map where the Designer Entrepreneurs have pin down their failures or the most common ones to elicit the conversation.

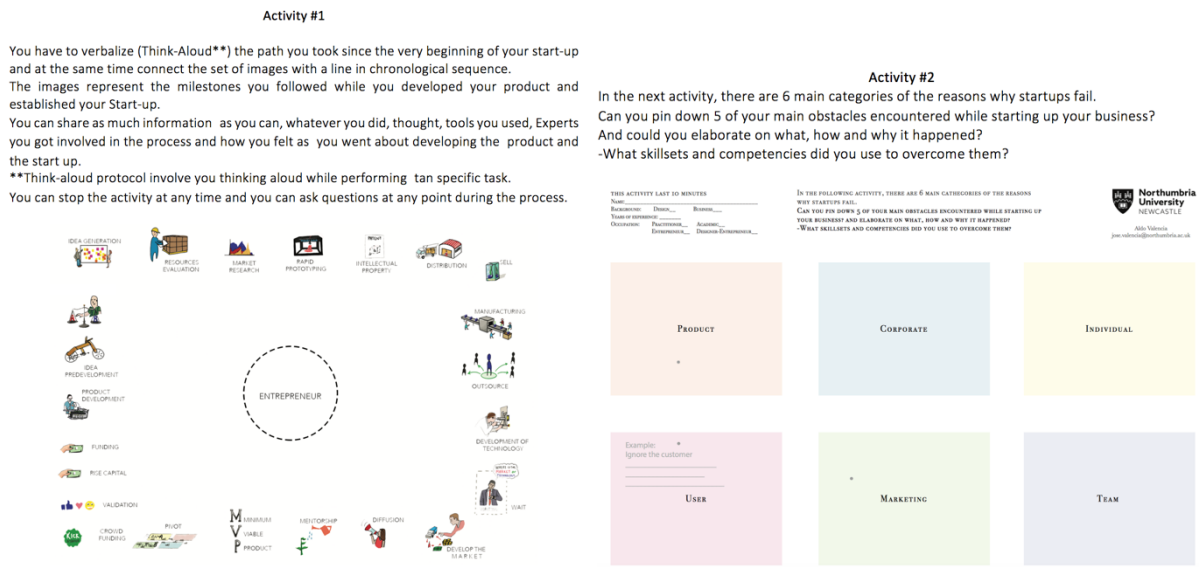


Figure 66. Sample of the visual aids used for the Phase Two data collection.

Other visual aids were developed, such as cards for a card sorting activity, a map to prompt discussion of potential failures, and a business model origami approach, however, the selected methods contemplates a data collection process that does not impose an unrealistic time requirement on selected respondents.

4.9 Summary of this chapter

The following image shows the research path of this study. During the data collection of the first series of interviews, the interview model developed its understanding of the issue. This led the enquirer to tweak the questions, ruling out the ones that were not transcendent for the study and then including ones that emerge from the interaction with the participants. After transcribing the first set of interviews, an interview model was developed, including the learnings of the first intensive exploration. This interview model has been used to explore in more detail specific themes that emerged during the former data collection. Figure 67 shows a visual summary of the two phases.

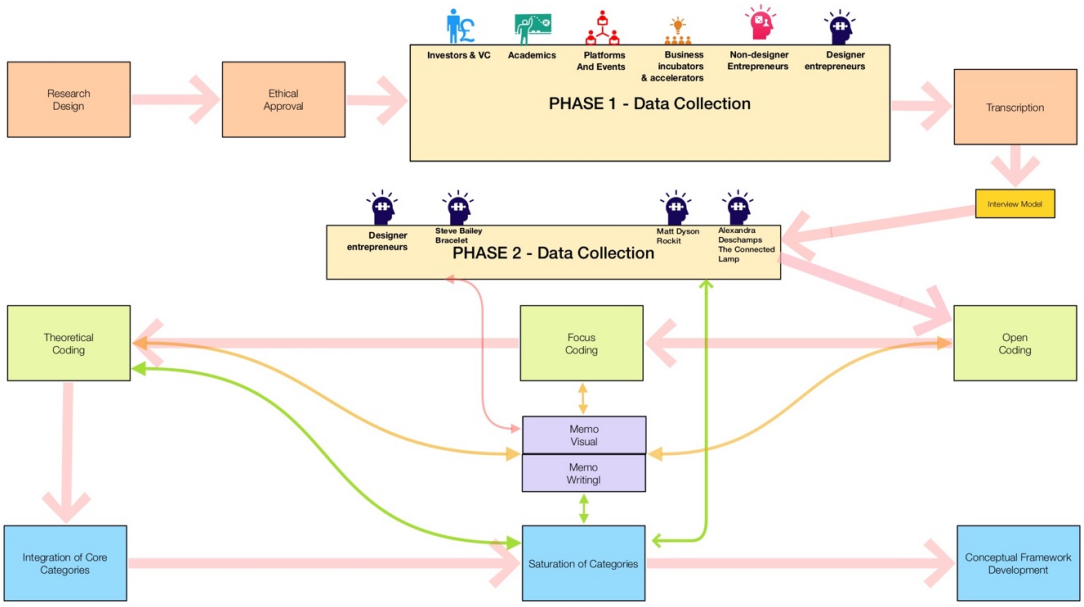


Figure 67. Path of the Research taken for this study; adapted from the Constructivist Grounded Theory model proposed by Charmaz (2006).

4.10 Data from Phase Two data collection

In this phase, the study draws upon the experience of 6 participants, who fully fit the criteria required. All of the entrepreneurs selected for this phase did their bachelor's degree in industrial design before starting up their business. They come from universities in Europe and America. None of the entrepreneurs involved in this phase had qualifications in business or management before setting up the company. The ages of the entrepreneurs in this study ranged from 29 to 49yrs at the moment of the first interview. The country chosen to manufacture the final products varies between the UK, Mexico and China. Depending on the start-up, the annual production varies from 300 to 35,000 units.

The participants of Phase Two come from a variety of industries, such as baby products, "*IoT*" devices, footwear, beauty, furniture and gadgets. These Designer Entrepreneurs have been involved from day one with designing, developing, and testing their concept as well as with the involvement in setting up the company and launching the product.

4.10.1 About the data collection

All the participants have been selected due to their fit with the specific criteria in this research. All of them have been reached personally by the researcher. To support the activity, the

researcher provided the interviewees with a glossary with the terminology used during the interview, but it was not necessary for any of the participants. The average time of the whole enquiry was 1 hr and 55 minutes divided into two interactions, more than the protocol said, due to the richness of the answers provided by the interviewees. Mainly, the enquiries were conducted in person by the researcher in multiple locations, yet, some participants with a very tight agenda were interviewed over the phone for the first part of the interview. The interviews took place in multiple locations in the world, including London, and Bristol in the United Kingdom; Queretaro in Mexico and Shenzhen in China.

The interviews were conducted following the interview model (please refer to Annex B). The first part of the interview helped the researcher to get an overall idea of the entrepreneurial journey of the participant. In most cases, due to the length of the whole inquiry and the availability of the interviewees, the session had to be split up into two, to allow the participant recall more details and avoid tiring them out. The lap of time in between the two activities helped the researcher to reflect on the answers provided by the participant, emerging new inquiries that potentially could give a better understanding of the issue.

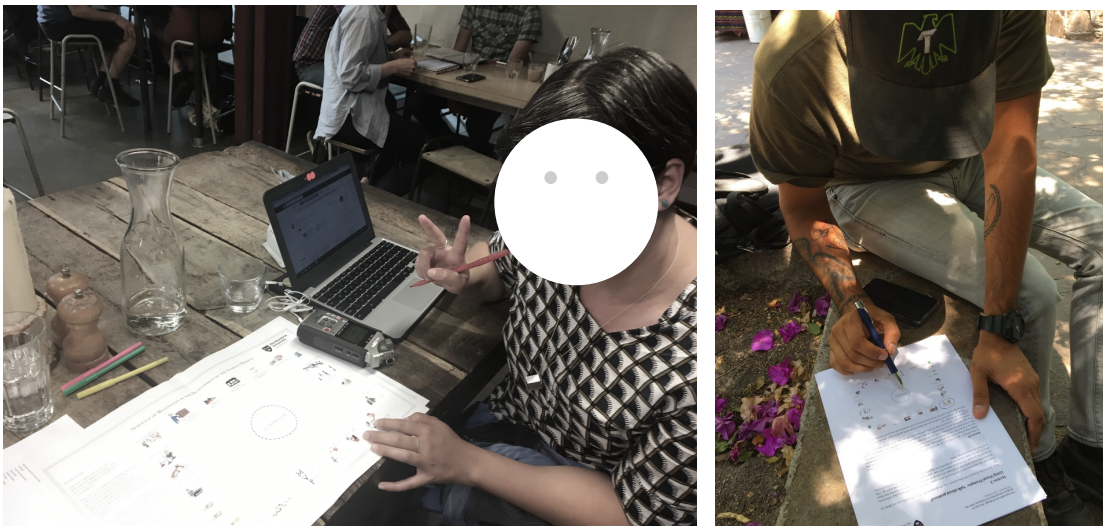


Figure 68. On the left, F2 talking about her entrepreneurial path and filling in the activity 2, London, UK; On the right hand, F 3 filling the activity 2, Queretaro, Mexico.

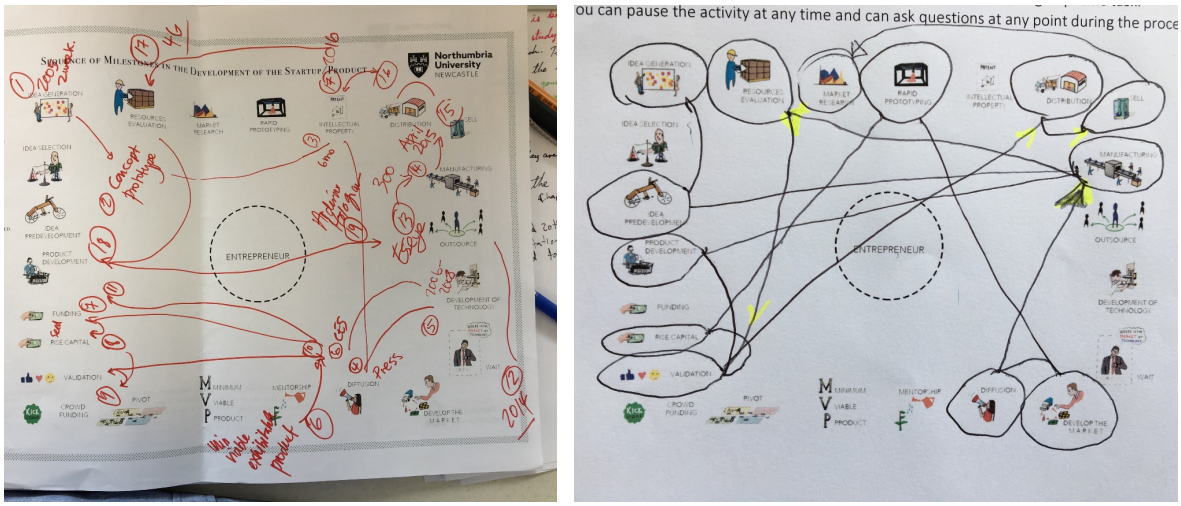


Figure 69. On the left-hand side, the entrepreneurial path drawn by F2, on the right-hand side, the entrepreneurial path drawn by F3.

4.10.2 Map of the chronology of events

To be able to accurate place the series of events of each start-up in a chronological way, multiple iterations were drawn of the activity 2. The initial maps were shown to the participants to increase the precision of the maps.

In figures 70 and 71, two examples of the iterations drawn are presented. The transcribed interview complemented the information of the map. The researcher asked the participants to revise the map after the first iteration. This increased the accuracy of the events and its sequence.

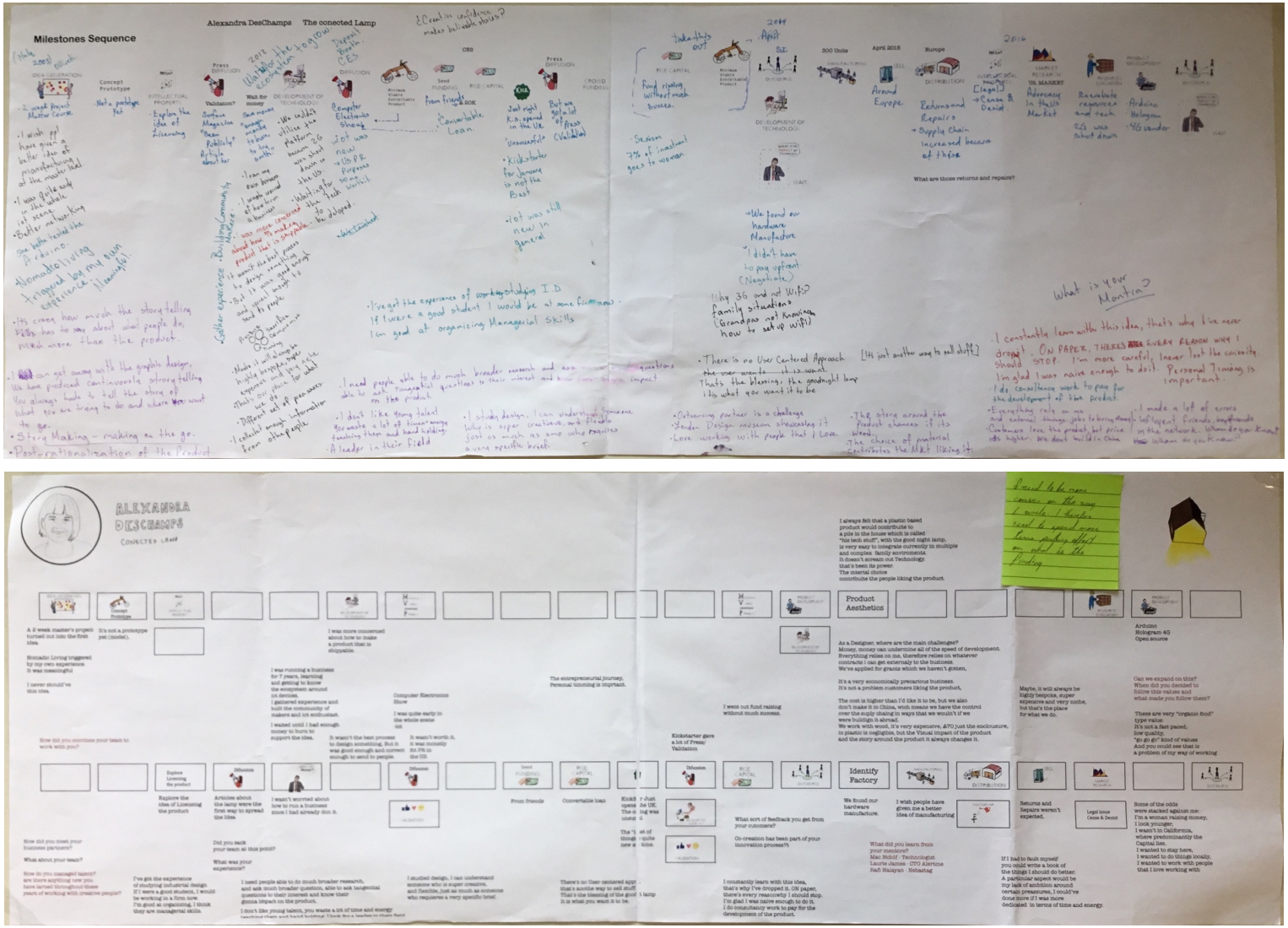


Figure 70. The upper image shows the first integration of the activity 2. The bottom image shows the additions that participants made from the first integration of the activity

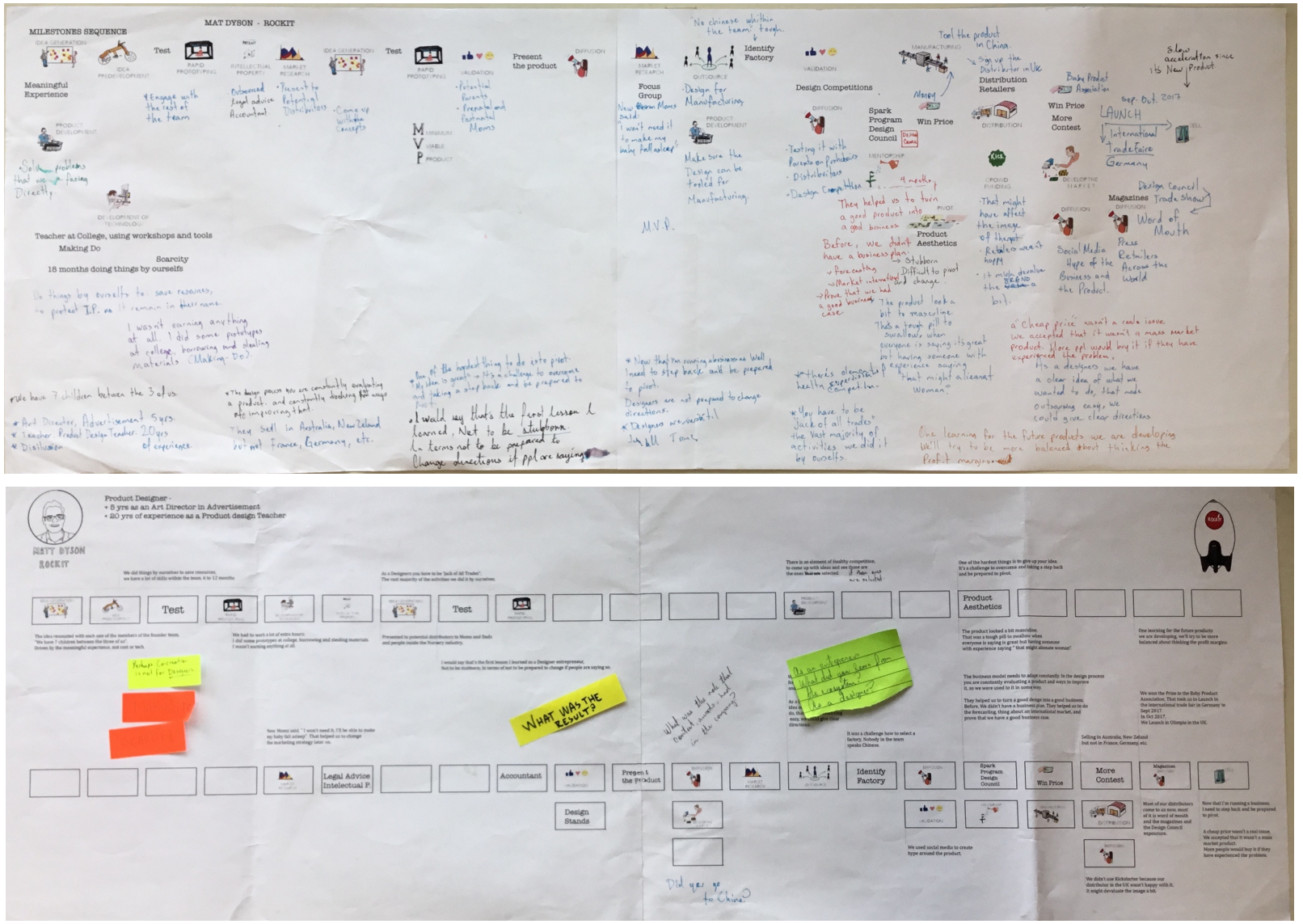


Figure 71. The upper image shows the first integration of the activity 2. The bottom image shows the additions that participants made from the first integration of the activity.

In Chapter 8.4 the final results of the activity are shown. This result considers the feedback from the participants.

4.11 Summary of the participants in the Phase Two

To anonymize all the participants, all references, specific details about their identity have been changed such as entrepreneur's name, company's name and the name of the product. However, a description of the product and the entrepreneur context is portrayed to help the reader understand the situation in the events outlined here.

Table 16. The following table shows the outline of the 11 participants in this phase.

Founder pseudo-nymous	**Product pseudo-nymous**	**Company pseudonym**	**Gender and Age (when the company start).**	**Industry**	**Location**
F1	P1	Baby Sleep	46yrs, Male	Baby products	UK
F2	P2	Device Connected	29yrs, Female	"*IoT*" Devices	UK
F3	P3	Trainers	27yrs, Male	Footwear	Mex.
F4	P4	Shaving	26yrs, Female	Beauty	UK
F5	P5	Sit Box	29yrs, Male	Furniture	Mex.
F6	P6	PenTronic	41yrs, Male	Gadgets	Ireland
F7*	P7	Bike Light	25yrs Female	Gadget	UK
F8	P8	CookingTable	23yrs Male	Homewares	UK
F9	P9	Doorman	25yrs Male	Kitchenware	UK
F10	P10	BabyIncubator	26yrs Male	Medical Device	Germany
F11	P11	Wearable tech	49yrs Male	Wearable tech	UK

Secondary data was utilised to supplement information of the cases of F7 and F8. Data of F9, F10 and F11 from Phase One was used in this phase due to the relevance and richness of information.

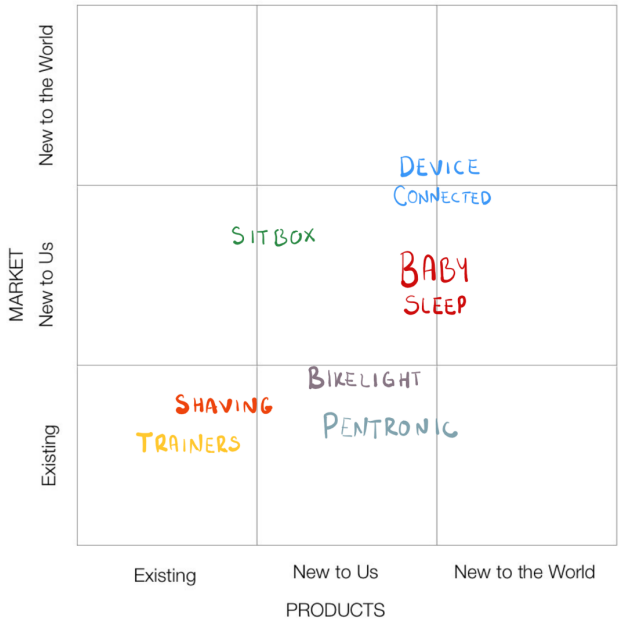


Figure 72. On the matrix above, there is the classification of the products based on their market vs product innovation; X-axis corresponds to the product and Y-axis to the market.

Image 72 presented the classification of the products based on their level of market vs product innovation when they were launched. This matrix has been introduced in Chapter 2.5.3 to facilitate the comprehension of the product environment.

The Device connected product came up closer to the upper right corner, where the disruptive concepts are. Since the idea came up in 2005, where the "internet of things", open-source hardware prototyping and rapid prototyping tools such as additive manufacturing were not ultimately settled, it was tough for founder 2 to approach to a traditional market. The product itself was quite revolutionary in the way design interacted with technology. It took the founder for more than seven years to finally launch it as a product.

Trainers are located on the opposite bottom left corner, where there is an established market and vast amounts of products offered. Despite requiring product development and marketing, the market is widely explored by uncountable brands in the world and the technology to manufacture the product has not changed at all.

For the case of Baby sleep, other products are offering similar functions available, but they are slightly different in terms of not being portable and attachable to multiple chairs, pushchairs or prams. The market for this product is not well explored since the availability of products to deal with baby's sleep if reasonably limited.

Bike light is a different concept of a cycling light. In terms of product, there are other products offering similar functions but not integrated into a single one, and in terms of the market, lights for bicycles is a well-established existing market. Therefore, the bike light is located on the bottom-centre.

In the case of Sit box, there are other examples of cardboard furniture around the world. However, they are handcrafted. The furniture market is traditional but not the recyclable furniture market. Sit Box explored the market in Mexico, which was not familiar with recyclable furniture.

In the case of *Pentronic*, the market of Stylus was already there before they launched, but the functions of the available product were limited. This product introduced a couple of features that made them innovative. The option to have interchangeable tips from different thickness, magnets to easily attach it to the body of the tablet and minimize the latency.

For the case of Shavers, similar products were in the market of straight razors before, but recently, the market for grooming for men has increased its size, despite being out there for more than a century, there is a new meaning attached to it, it is more than shaving, it is the ritual of being a man where the opportunity lays. Its innovation is incremental in its aesthetics and usability. As a result, the market and the product are relatively traditional.

4.12 Description of the participants and their start-ups

4.12.1.1 About the company BABY SLEEP

Baby Sleep is a company based in the south of the UK. Founded by three friends with diverse backgrounds in acoustics engineering, mechanical design and industrial design. Between the three of them, they have 7 children which gave them the accountability to know about the problems associated with babies, wellbeing and parenthood. This company has won several awards in the UK and Europe. Their clientele is distributed in 3 continents and have signed with multiple distributors across the world to expand their operations. It is a single product company so far but they are doing research and development to launch other products in the same baby care sector.

Table 17. Summary of the company Baby Sleep.

Industry	Origin of the idea	Designed in	Made in	Annual sales (Units)
Baby Care	UK	UK	China	<14,000

4.12.1.2 About Founder 1 (F1)

Founder 1 is a former art director at a marketing company and reader in Industrial Design. He has run a design & prototyping consultancy. His current role in the company involves new product development, R&D and manufacturer liaison. He participated in this research on the first phase of the data collection, and kindly agreed to participate in the second phase.

Table 18. Summary of the F.1

Background	Origin	Current Age	Current Role
Industrial designer, Lecturer, Art director in a Marketing company	UK	49yrs	CEO Baby Sleep

4.12.1.3 About the Product (P1)

BabySleep is a baby product aimed to support parents to make their babies fall asleep. Using an eccentric load attached to the shaft of an electric motor and powered by batteries, this device shakes the pram of the baby to create a pleasant move, helping parents to soothe the baby. It is a plastic case with a battery and circuitry inside, that can be attached to the baby's pram.

4.12.2.1 About the company DEVICE CONNECTED

The company *Device Connected* is a single-founder & single-product company. The product belongs to a cross-industry called "*IoT*" (internet of things). *IoT* is the term used to refer to devices or mechanical or digital machineries interconnected in a network, usually human-to-human but also human-to-computer.

This is the eldest company in the study, the idea came up in 2005, and their first prototype came out in 2013. It took 7 years to wait for the market and the technology to develop and be capable to launch this device.

Table 19. Summary of the Device Connected.

Industry	Origin of the idea	Designed in	Made in	Annual sales (Units)
Internet of things, Gadgets	Italy	UK	UK	< 500

4.12.2.2 About Founder 2 (F2)

Founder 2 is a female Designer Entrepreneur who is 42 years old and based in London. She is a published author, consultant, public speaker and entrepreneur with a background in industrial and interaction design. She has been acknowledged as a leader in the *IoT* community by universities, museums and the community in general.

Table 20. Summary of the F2

Background	Origin	Current Age	Current Role
Industrial designer, Author *IoT* Consultant	Canada	42yrs	CEO Device Connected

4.12.2.3 About the Product 2 (P2)

The product *P2* has been built for nomad and lonely people around the world. The device is connected to a network of other devices. The owner of the *device connected A* can turn on and off a LED in the *device connected B* owned by a family member or friend in another part of the world, or the same city. It is a plastic case with circuitry inside and a 4G telecommunication antenna to get access to the internet.

4.12.3.1 About the company TRAINERS

Trainers is a streetwear company based in Mexico, founded by two friends, a photographer and an industrial designer. Both share the passion for design, fashion and streetwear. Their first product line was footwear inspired in the streetwear from the South West of USA. They launched in 2012 and since then they have expanded the business to apparel and accessories.

Table 21. Summary of the Trainers.

Industry	Origin of the idea	Designed in	Made in	Annual sales (Units)
Footwear	Mexico	Mexico	Mexico	< 2000

4.12.3.2 About Founder 3 (F3)

F3 majored in industrial designer and then obtain a master's degree in footwear design. He has worked in Mexico and China, and thanks to his current experience in footwear, he trains and couch other entrepreneurs in the fashion industry.

Table 22. Table. Summary of the F3.

Background	Origin	Current Age	Current Role
Industrial designer	Mexico	32	CEO Trainers

4.12.3.3 About the Product 3 (P3)

The Product *P3* are street style trainers. In this case, the study considers all the collections released as part of the iterative design process that took the company to reach quality, looks and specifications of the desire product. Each one of those collections were sold to their friends and families. The researcher decided to consider them as a one product due to the multiple iterations the entrepreneurs had to go in order to get a desirable product and be able to sell in retail.

4.12.4.1 About the company SHAVING

Shaving company is an industrial design agency founded by two friends, both industrial designers. They have designed a wide range of products for other companies in industries such as consumer products, consumer goods and internet of things. They decided to set up a company after working as free lancers and having to issue an invoice.

Table 23. Summary of the company Shaving.

Industry	Origin of the idea	Designed in	Made in	Annual sales (Units)
Health care	UK	UK	China	< 1300

4.12.4.2 About Founder 4 (F4)

F4 is an industrial designer, currently appointed as the CEO and CDO of the company. She is an author and influencer. She is currently involved in supporting other start-ups to make their ideas desirable and feasible.

Table 24.Summary of the F4.

Background	Origin	Current Age	Current Role
Industrial designer, Freelancer, design consultant.	UK	29	CEO Shaving

4.12.4.3 About Product 4 (P4)

Shaving was founded by two industrial designers. The current CEO is a Female Designer Entrepreneur, 29 years old and based in London. Its most famous product is a straight shaver, but they also have joint efforts with other start-ups to launch more than 10 tangible products to the market including grooming, travel and technology products). Shaving also has published their own book, containing their ideas and values they follow in their design process.

4.12.5.1 About the company SITBOX

SitBox is a company setup by two brothers and a friend, all of them industrial designers. They spotted the opportunity to create furniture with cheap and recyclable materials. They tapped into their skills in 3D modelling and expertise to employ cardboard to design their products. They were concerned about the environment while they developed the company, so sustainability was engraved at the core of the venture from day 1.

Table 25.Summary of the company SitBox

Industry	Entrepreneurs origin	Origin of the idea	Designed in	Made in	Annual sales (Units)
Furniture	Mexico	Mexico	Mexico	Mexico	< 5000

4.12.5.2 About the Founder 5 (F5)

F5 is an industrial designer, lecturer and event organizer. He runs one of the most important design events in Mexico where international speakers share their experiences with local designers.
His cofounders are also industrial designers.

Table 26. Summary of the F5.

Background	Origin	Current Age	Current Role
Industrial designer, Lecturer, Freelancer.	Mexico	34	CMO

4.12.5.3 About the Product 5 (P5)

Product 5 is a card box stool. The first prototyped stool took 5 minutes to be sold after they uploaded on a social network. This first prototype became their first final product since it was the first one to be sold. In order to see the evolution of the start-up and the personal journey of the entrepreneur, a wider sample of items will be considered.

4.12.6.1 About the Company PENTRONIC

Founded by an industrial designer/serial inventor, *PenTronic* is a product design company based in Ireland. Its first launched product is a stylus for touchscreen devices. The company ran a very successful campaign on a crowdfunding site in Ireland, selling more than 25,000 units during its first year.

Table 27. Summary of the company Pentronic.

Industry	Entrepreneurs origin	Origin of the idea	Designed in	Made in	Annual sales (Units)
Gadgets	Ireland	Ireland	Ireland	China	< 25,000

4.12.6.2 About the Founder 6 (F6)

F6 is an award winner inventor and University lecturer in Ireland. He has appeared twice in one of the most famous investment TV shows in Europe and run a couple of very successful campaigns in crowdfunding sites. Currently, he has under his belt, expertise in supporting entrepreneurs in industrial design in more than 250 projects. Founder 6 has multiple patents and awards acknowledging his creative talent as an industrial designer.

Table 28. Summary of the F6.

Background	Origin	Current Age	Current Role
Industrial designer, Lecturer, Design consultant, Innovation Consultant	Ireland	34	CEO Design Director

4.12.6.3 About the Product 6 (P6)

P6 is a stylus for touchscreen devices. The idea emerged after seeing all the bulky and not accurate products available for touch screen devices. The entrepreneur itself was a keen user of these devices and spot the opportunity caused by the lack of accuracy and portability that other devices had.

4.12.7. 1 About the Company BikeLight

Founded by an Industrial designer at the backend of her dissertation at university, BikeLight is a product company based in London, UK. The company ran a very successful campaign on a crowdfunding site in UK, raising up £55,000 with 782 backers. In the first year she sold 3,000 units.

Table 29. Summary of the company BikeLight.

Industry	Entrepreneurs origin	Origin of the idea	Designed in	Made in	Annual sales (Units)
Gadgets	UK	UK	UK	China	< 3,000

4.12.7. 2 About the F7

F7 is an award winner Designer Entrepreneur from London, UK. She has appeared in multiple programs, events and contest. She is a speaker and a mentor. She campaigns in crowdfunding sites. Currently, she is running a company doing product development to improve safety in mobility in urban areas.

Table 30. Summary of the company F7.7.6.7c About the P7

Background	Origin	Current Age	Current Role
Industrial designer, Lecturer, Design consultant, Innovation Consultant	UK	30	CEO Design Director

4.12.7. 3 About the P7

P7 is a bicycle light and laser that prevents accidents in urban areas. The idea emerged at university, as a part of her last project for her dissertation. She got the idea after following the human-centred design approach, and spending many hours on the road and talking with stakeholders involved in mobility.

Table 31. The next table is a summary of some similarities found among the companies.

Name & Company	**Co-founders, Where did they meet?**	**University lecturer**	**Industry**	**Origin**	**Family depending from the founder's income?**	**I designed this product based on:**	**I ask for investment in a TV Show**	**I ran a crowdfunding campaign for this product**	**My product has won design or product contest**
F1 Babysleep	Through Family	Yes	Baby products	UK	Yes	My own experience	No	Yes	Yes
F2 Device C.	At University	No	"*IoT*" Devices	UK	No	My own experience	No	Yes	Yes
F3 Trainers	At University	No	Footwear	Mex.	No	My passion	No	No	No
F4 Shaving	At University	No	Beauty	UK	No	A gap in the Market	No	Yes	Yes
F5 SitBox	At University	Yes	Furniture	Mex.	No	Explore capabilities	Yes	Yes	Yes
F6 PenTronic	At University	Yes	Gadgets	Ireland	No	My own Experience	Yes	Yes	Yes
F7 Bike Light	Job Vacancy	No	Gadget	UK	Yes	Human Centred Design	No	Yes	Yes

CHAPTER 5: FINDINGS AND DISCUSSION

5.1 Introduction to the chapter

This chapter presents the findings of the study, followed by a discussion section. Wolcott (1994) suggested that the analysis of the data develops in a progressive focus, shifting from a description of the events towards the interpretation of them. The ***first section*** of the chapter ***presents the findings in a neutral voice,*** describing the connections between the elements, themes, and categories. The ***second section*** of the chapter, the discussion section, adds the ***researcher's interpretations*** and the comparison between the categories and triangulation with previous theories and recent studies in the Design Entrepreneurship field.

5.2 Data analysis

Robson (2002) suggested that data analysis can be accomplished following three specific steps:

1. Look for patterns – establishing patterns of behaviour, logic, action and thoughts.
2. Look for key events: document focal events, and
3. Triangulate the sources of information against each other.

Following these recommendations, this chapter has been integrated into three sections:

The first section presents the results of the activities and interviews in a chronological map to inform key or focal events. A timeline of each start-up has been developed to facilitate the reader to understand the evolution of the product/start-up/individual. The sequence of events is accompanied by small notes and comments to give a profound view of the events and why they are considered in each milestone of the entrepreneurial journey.

The second section of this chapter compares the responses from the participants with the typology created in Chapter 2. This section looks for patterns considered in DECPI typology, which serves as a priori coding. It presents interview data relating to each one of the milestones and identifies where there is a consensus between the participants. This information gives a sequence of steps and how they coincide and differ from each other. Extracts from the interviews have been selected to portray the concept and the perception of each one of the entrepreneurs.

The third section presents the emergent themes, those who were not predicted in the typology from Chapter 2. The coding process allowed the data to inform potential new leads and areas in the Design Entrepreneurship field. This section of the chapters shows collections of these interview extracts, which seem to share a common premise, and proposes titles for those, as emergent themes in the research.

In sections 2 and 3, direct quotes from the data, field notes and diagrams are integrated, to correlate and strengthen the credibility of the interpretation of the data (Tuckett, 2005; Thomas and Magvilvy, 2011).

The emergent themes identified in this way come from multiple participants to allow the researcher to tell the collective story. This follows Charmaz constructivist Grounded Theory approach where the analysis builds through the collective story and not only the individual story (Charmaz, 2011).

5.3 Background of the entrepreneurs

Despite having the same major, the industrial designers interviewed in this phase have different skillsets. The eldest participant is 49 years old, and the youngest is 29 years old. That makes a 20 years gap between them. Design and technological tools changed dramatically over the last decades, helping designers have different ways to discover, conceptualize and materialized their ideas. This might be a subtle clue that the creative process itself has changed or it has adapted to the new tools, ecosystem and the ways to make ideas come true. The potential users of their products in most cases fit with the designer's lifestyle and personal interest. Still, there are two cases where the market opportunity was the one leading the entrepreneurial effort. Based on their experience, all the entrepreneurs can be considered in a later stage of their lives compared to when they set up the company. However, this study can make a distinction between the designers who had a career as an industrial designer before setting up the venture and the ones who started right after or during university. There are three participants who had experience in industrial design before setting up their companies and five participants who started the company while they were at university or just right after finishing it. It is important here to underline the fact that the youngest Designer Entrepreneurs of the sample are the ones who started their companies' just right after university, and they were more familiarized with the idea of entrepreneurship as a career path. Despite not having this as the first option for a career path, they also were attentive to the changes the industry had, such as new distribution channels, new funding mechanisms, new prototyping tools, new supply chains and new methods to reach potential customers.

5.4 Findings – Section one

The participants from F1 to F6 of the study, responded to all the questions and activities from the interview model. The map of the milestones included in the activities helped the researcher to build a chronological map of the evolution of the product, the start-up and the individual. Since Grounded Theory considers external documents and secondary interviews as valid sources of data, this study introduces the case of F7. This case has been considered for the vast amount of information available and its pertinence to the study. Participants from F8 to F11 participated in the Phase One data collection and in the first section of Phase Two data collection. They skipped the second section due to time and convenience reasons.

In figure 73, a visual timeline has been drawn to allow the researcher to identify each part of the process. In figures 74 to 79, the reconstructed timeliness of each DE participant in Phase Two data collection are shown in detail. The timelines were used by the researcher as a basis to reconstruct the story of the entrepreneurs. The most important events are portrayed and described. It is evident that Designer Entrepreneurs changed their priorities, having an impact in the trajectory of their start-ups and their products. The chronology map helped the researcher to identify the moments where these changes happened and what triggered them.

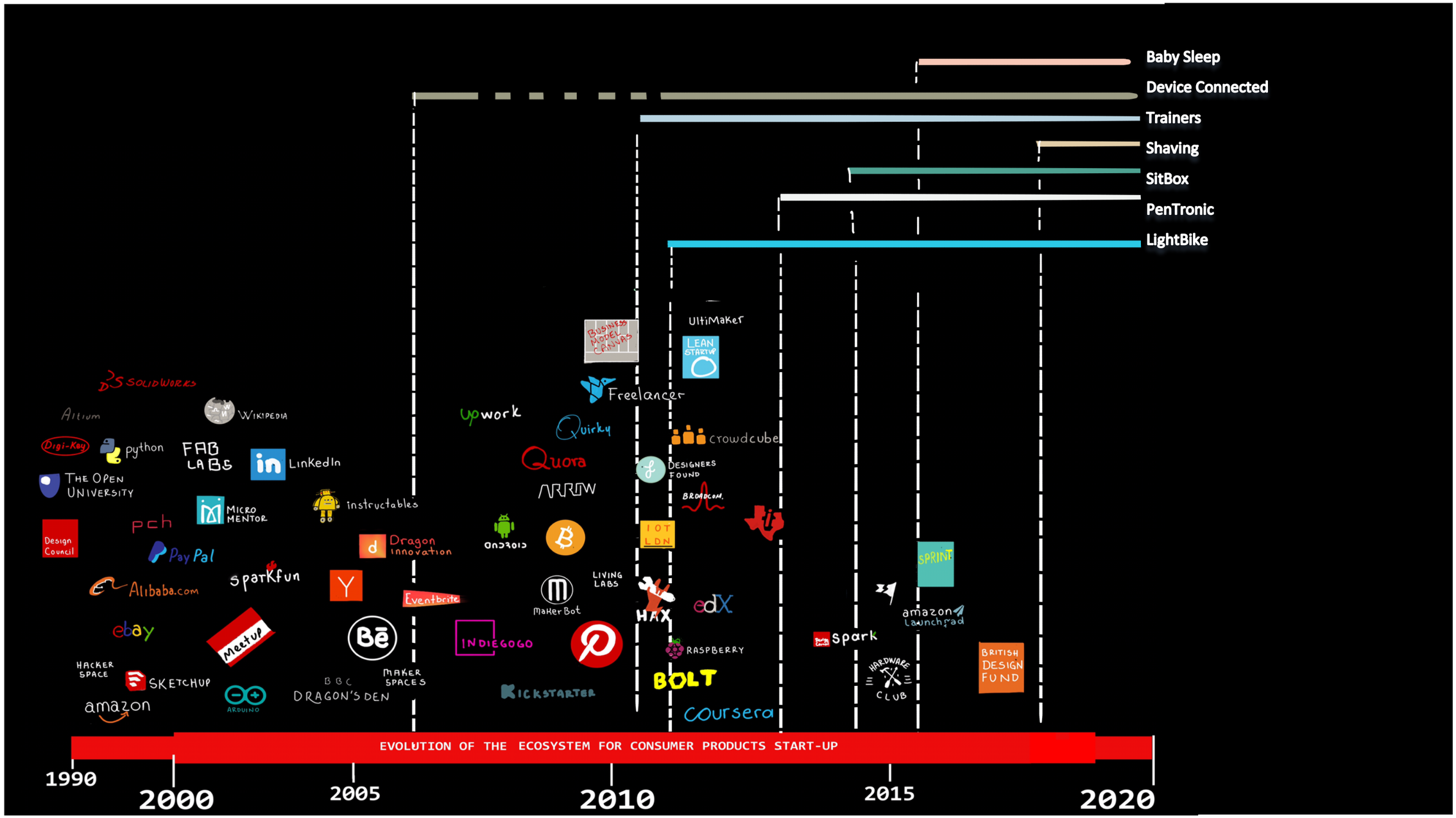


Figure 73. Start-up's year of launch and the comparison with maturity the ecosystem.

The idea was presented to the rest of the team in a family event

The fact that we have 7 children in total (between the 3 founders) helped us to identify instantly the opportunity.

I wasn't making any money at all, but I was convinced that this was a great idea.

One of the founders has a doctorate in engineering, he started developing the technology.

One of the hardest things is to give up your idea. It's a challenge to overcome and taking a step back and prepare to pivot.

The product looked a bit masculine. That was a though pill to swallow, when everyone is saying "it's great" but an expert saying "that might alienate women".

One learning for future products we are developing is to try to be more balanced about thinking the profit margins.

PRODUCT

Idea generation | Idea Pre-development | Test | Rapid prototyping | Technology development | Intellectual property | Idea generation | Test | Rapid prototyping | | Engineering Validation Test (EVT) | | Product development | | Product aesthetic | Packaging | | |

Design Validation Test → Design Validation Test → Production Validation Test

We did all the things by ourselves to save resources (pre-development of the idea)

I used everything I had at hand. I used the machinery from the college I was working for and stole and borrowed the materials.

Before asking for feedback we wanted to protect the intellectual property of the product.

We started collecting the opinion from different potential distributors, Moms and Dads, and people inside the nursery industry.

The business model needs to adapt constantly. In the design process you are constantly evaluating a product and ways to improve it, so we are used to it in some way.

We start selling in Australia and New Zealand before going to France and Germany.

START-UP

Design point of purchase | Present the product | Identify Factory | Outsource | Diffusion | Mentorship | Prize (money) | Distribution | Magazine diffusion

Market research | Legal advice | | | Accountant | Validation | Difussion | Develop the market | Market research | Validation | Spark program Design council | Manufacturing | Diffusion | Sell

Prize (money and diffusion)

New moms said "I won't need it, I'll be able to make my baby fall asleep. That made us change the strategy, to people who had experienced being sleep deprived.

They helped us to turn a good design into a good business . Before we didnt have a business plan. They helped us to do the forecasting thing about an international market and prove that we had a good business case.

Most of the distributors come to us now, is word of mouth.

A cheap prize wasn't areal issue. We accepted that it wasn't a mass market product.
More people would buy it if they had experienced the problem..

The story and the vision helped us maintain the alignment of the business goal and the product goals.

There is a healthy competition within the team, that creates a nice tension to innovate and say "I proposed that idea"

This idea was not the result of market research, user research or technological breakthrough. It was born as a result of a personal need and observation.

Aligned with the effectual logic, available means were utilized to reduce cost and time of development. Also, there was no need to learn new techniques.

I realized that we had a powerful story behind the product. The idea of three dads trying to invent products to help parents and Babies.

Profit / Product driven

INDIVIDUAL LEARNING

Idea driven / Personal meaning | Combinational thinking | | Exploiting given means | | | Authorship | | | | Storyteller | | Progression over perfection | | | | | Flexible / Adaptive

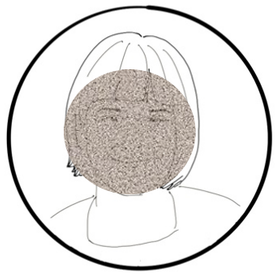
The available items in the garage were combined to explore the concept of rocking the baby's pram.

Good enough is good enough.

Now that im running a business, Im ready to step back and be prepared to pivot.

The shaker

Figure 74. Product, start-up and individual timeline of the entrepreneurial journey.



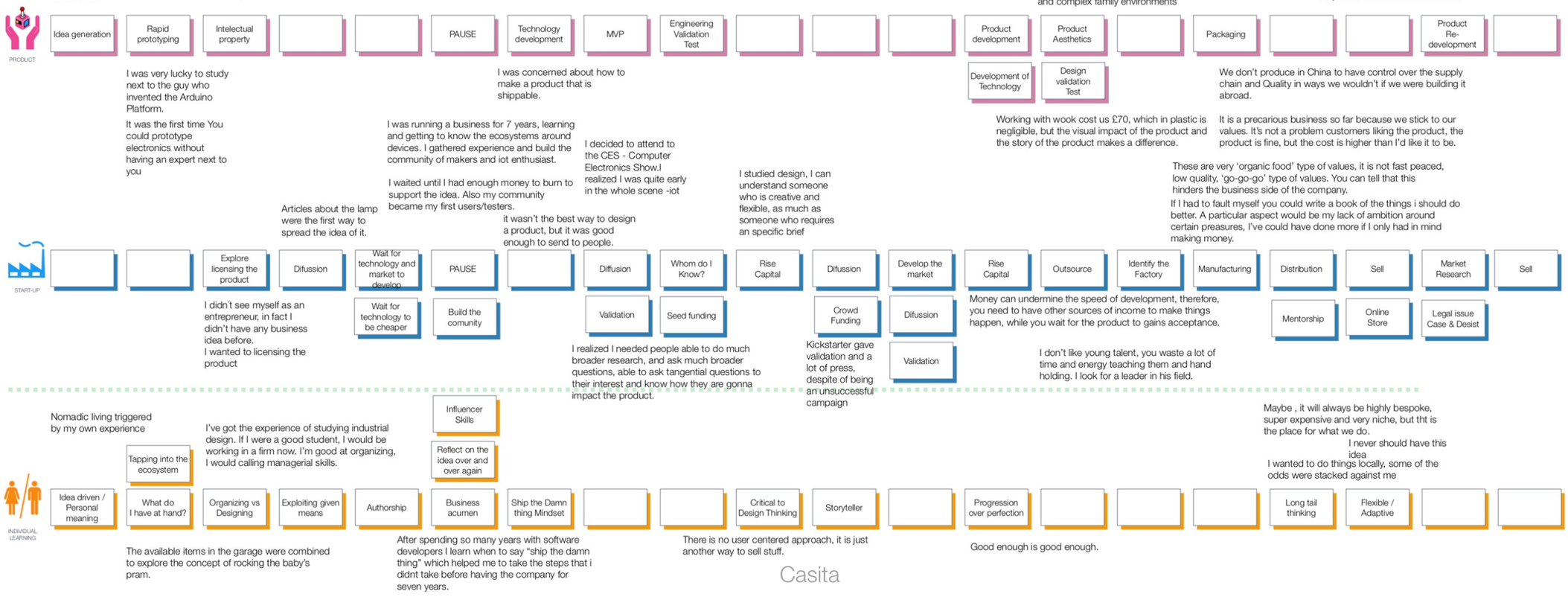


Figure 75. Product, start-up and individual timeline of the entrepreneurial journey.

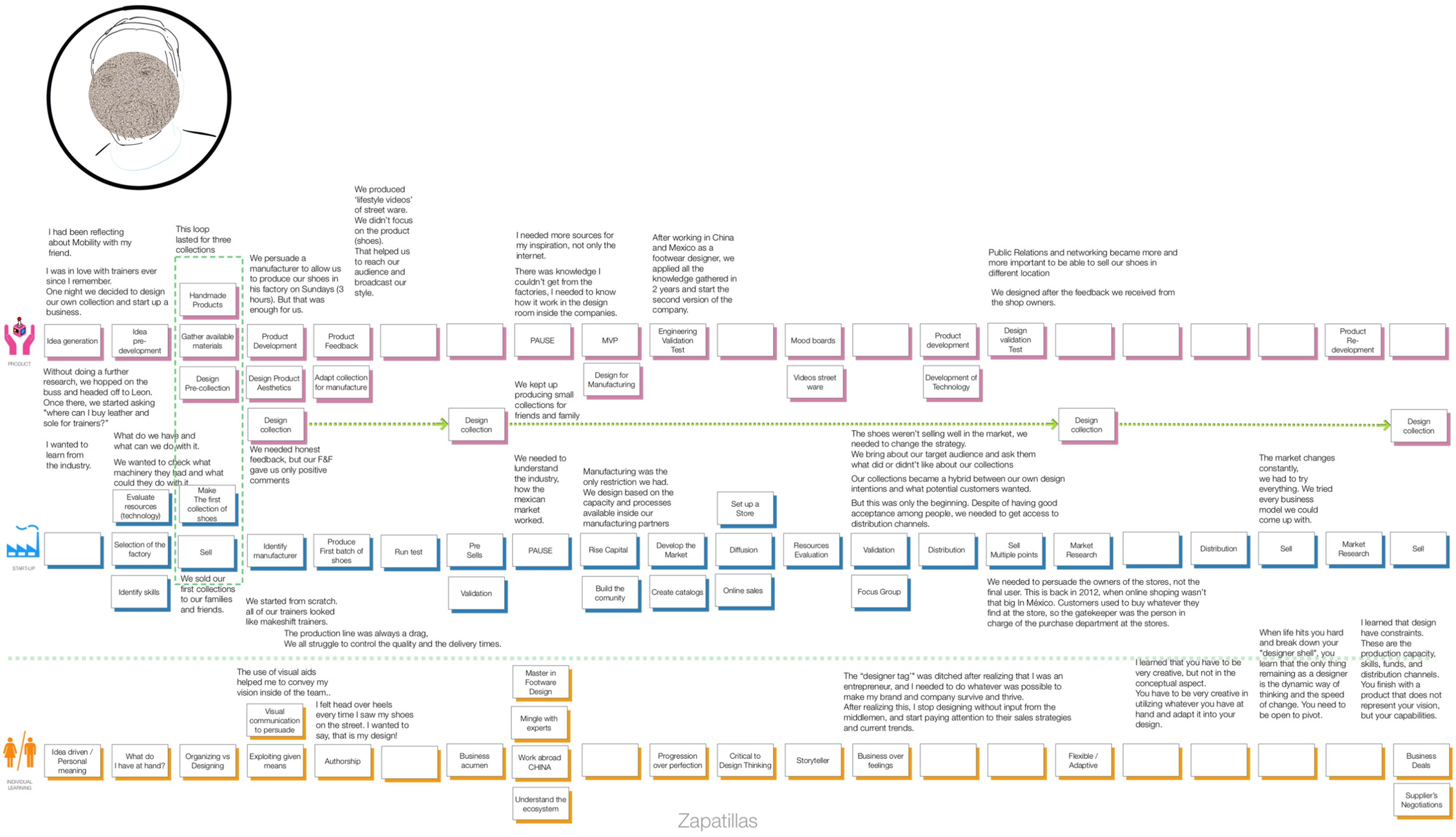


Figure 76. Product, start-up and individual timeline of the entrepreneurial journey.

PenTronic

The idea came up after trying several stylus for touchscreen devices. The lack of accuracy and portability were one of the main concerns.

There was s delay in connectivity, which meant that the response rate was low between the pen and the screen..

It took around 100 iterations to get the product where we wanted it to be

We looked up for some patents, just to see if there was something else going on in this direction.

Checking up the patents provided us some ideas. We got back to the drawing board.

The idea came up after trying several stylus for touchscreen devices. The lack of accuracy and portability were one of the main concerns.

We learned to minimize the number of parts in our design. Each part introduced potential errors, delays and customer complaints.

We prepare all the Design and engineering details to go to China.
It was the first time we had to do it for our own company. We had so much skin in the game so far. Specially because we had thousands of backers waiting for their product in less than a year or so.

We sorted out issues related to the quality of the product in our first batch. We had the CM (contract manufacturer) to be able to keep the intellectual property of the product, but some changes in the design process would have been easier to solve if we had ODM (Original Design manufacturing). at the end we sort it out but we had a little delay with our backers.

PRODUCT

Idea generation | Gather the resources | Quality related problems

Spot the opportunity | Idea pre-development | Rapid prototyping | Idea generation | Rapid Prototyping | Design for manufacturing | MVP | Engineering Validation Test EVT | MVP | Engineering Validation Test | Design Validation Test | | Design Packaging | Product development | Design validation Test | Production | Manufacturing Validation Test | Production | | | |

Rapid prototyping | Develop the Technology | Intelectual Property | Select Manufacturer | Development of Technology

The second problem I concentrate on was the size and weight of the tip of the stylus

We added a feature to increase the product lifetime. Replaceable tips . If technology changes, you can change the tip.

We first tackled the issue of connectivity by utilizing aircraft aluminum to maximize connectivity. We worked on a project before using this material, so we knew already this could work in this case.

I had some ideas about what could improve the portability. I wanted to explore with materials and shapes. We added some neodymium magnets to keep them attached to the touchscreen

We didn't know what step was the next one. We approach a business mentor to ask for advice

We had to decide weather to produce in Ireland or in China. Keeping the overheads low made us decide to produce in China.

Deliver the orders made by the backers. That boost anyone's confidence, seeing all those months spent and you finally are able to tell your client 'there you go, enjoy"

Technological disruption in the screen of devices made this product stop

I wouldn't call it market research, but I already tested around 10 different stylus by the time I decided to take this idea seriously.

START-UP

Size the Market | Viability study | Evaluation of the manufacturer | Find international Distribuitors | Distribution | Sales in Retail | Sell

Market Research | | | | Diffusion | Mentorship | Market research | Crowdsourcing | Rise Capital | Develop the Market | Diffusion | Resources Evaluation | Validation | | | | Difussion | Deliver products to backers | Distribution | Diffusion | Hacker community

Build the comunity | Website | Validation | Sales in online retailers

We decided that this product was solid enough already to go and test the new crowdfunding platform.

Before I got myself into this project, I had founded a design hub in Ireland. We always had people willing to test our ideas

This feature became one a key selling point. Other stylus were designed as a throw-away producs, easily lost or miss placed.

We produced material to share in social media and start to raise awarenes.

The crowdfunding campaign gave us a lot of attention, that draw us our firsts distributors orders

People started adapting the PenTronic to their specific activities, a hacker community started to gestate

Being involved in so many other projects was really important to cross germinate new ideas understanding new technologies.

I am an avid believer of James Dyson philosophy: "design something that solves problems".

It takes a strong person to step up and say "here this is how we are gonna make this". Designers tend to be a little quiter, but when you step up you can take the project off e ground, helping the team to figure out problems.

Crowdfunding sites provides information beyond price. You can finally check if your idea or prototype is something worthwhile trying. It can ditch the idea you've been working on for the past months in days though.

"It's about taking the chance; if you don't stick your neck out, you won't get anywhere"

I wouldn't say this product was easy, but we certainly had the advantage of having worked for years together and knowing our strenghts. this is a team effort, entrepreneurship is a people's job."

You have to keep an eye out to see what your customers need. The hacker community is something possitive

INDIVIDUAL LEARNING

What do I know? | Micro Test Micro Pilots | Passion

Inventor mindset | | Work with your given means | | | | Business acumen | Learn about Crowdfunding | Storyteller | | | | | Keep Optimistic | | Flexible / Adaptive | | | Human capital as the key to success | Learn about Negotiation | Business Deals | Community not customers

Supplier's Negotiations

Was not difficult to get the materials we needed, we already had some at the hub. It was the chaff of previous projects. We already work with this material so we knew its properties.

I started a blog to get closer to our community, share ideas and new features of "PenTronic"

I was aware of the market trends and technological break throughs. Therefore, i had a very hands on approach to explore new ideas. I came up with the idea and pre-"prototype it" almost simultaneously.

Keeping our clients informed was so advantageous when we couldn't meet the deadline.

If you are passionate about something you can take a lot and still feel enthusiastic about the future.

Figure 77. Product, start-up and individual timeline of the entrepreneurial journey.

Shaving

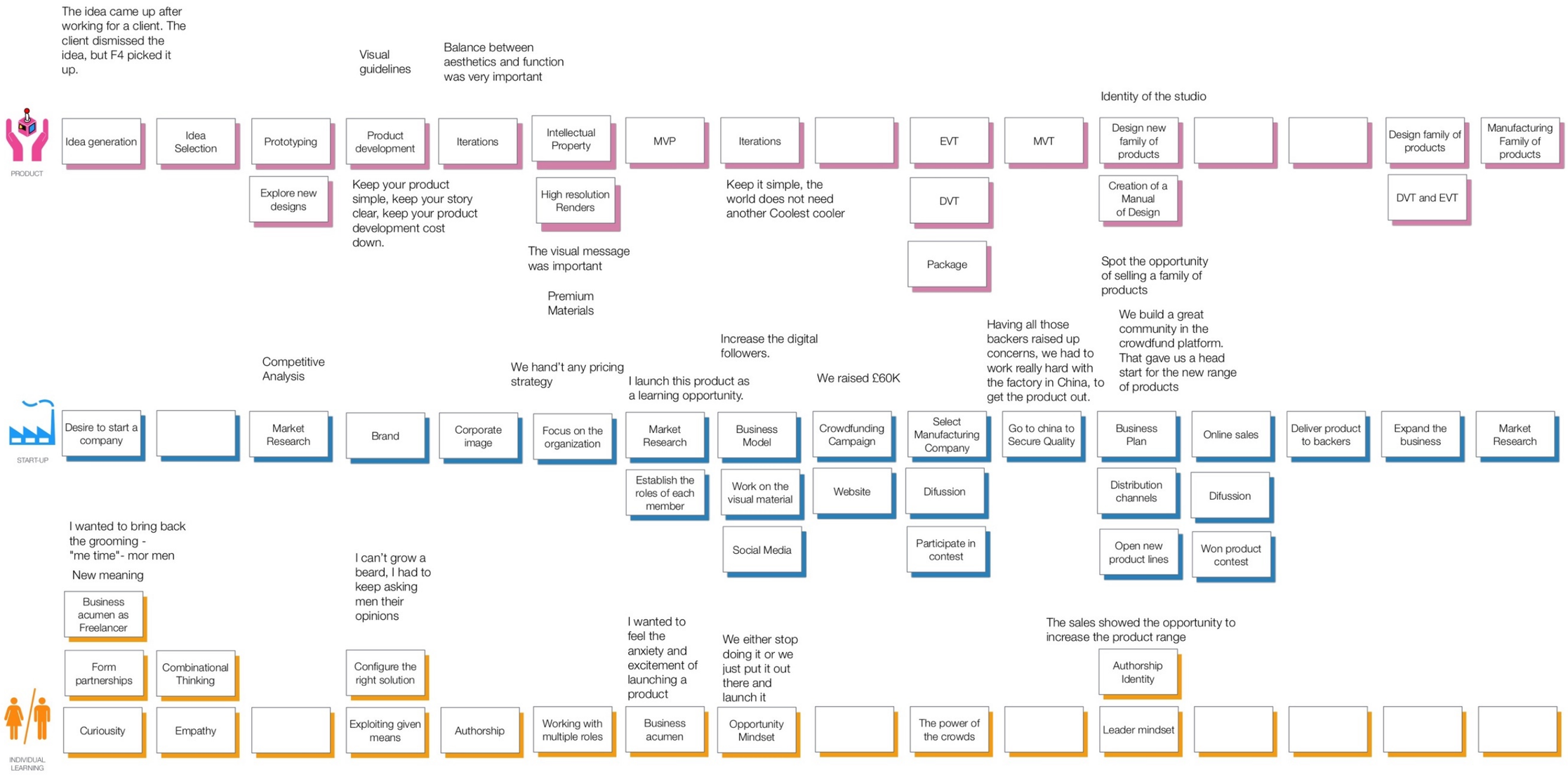


Figure 78. Product, start-up and individual timeline of the entrepreneurial journey.

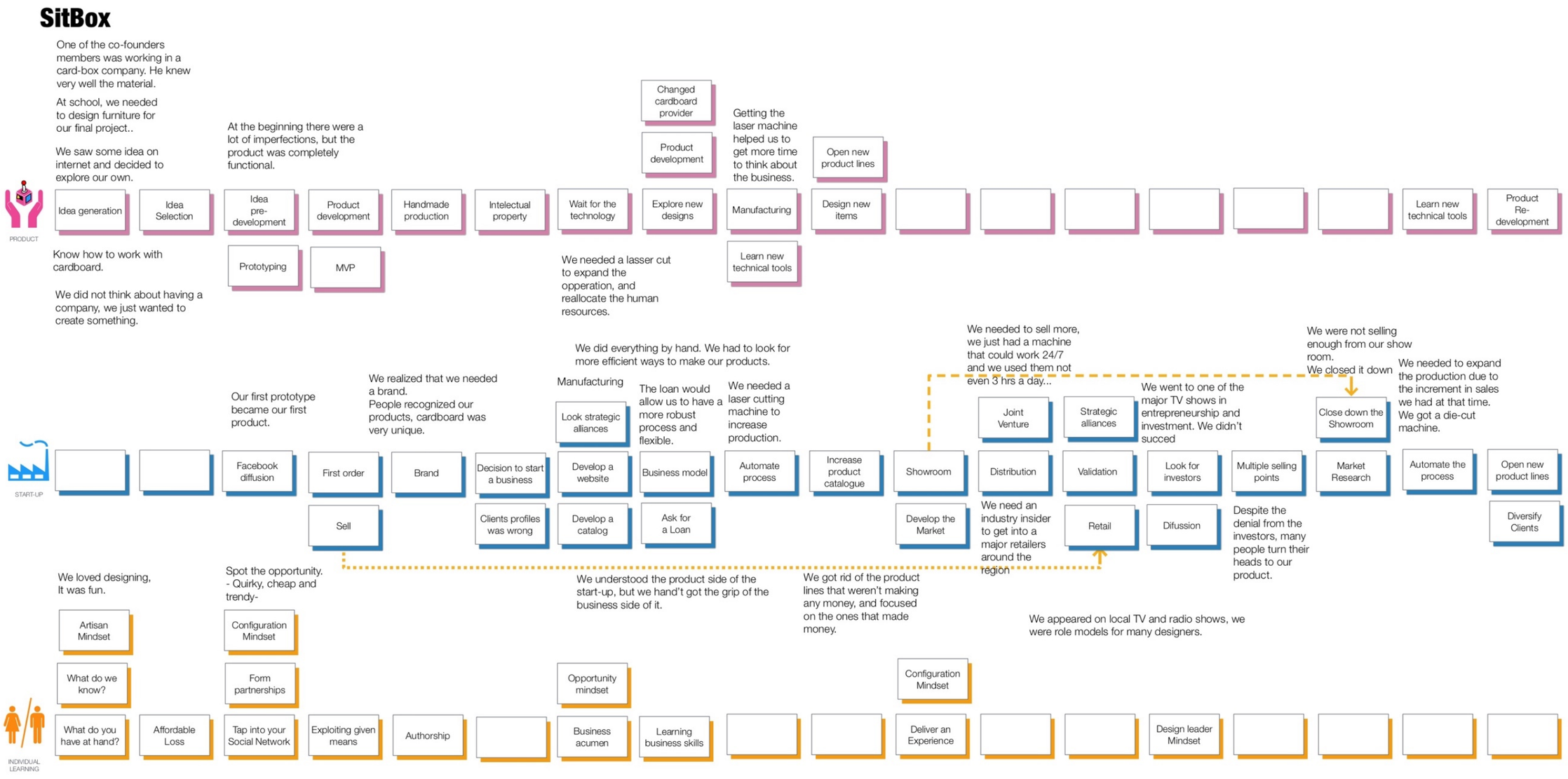


Figure 79. Product, start-up and individual timeline of the entrepreneurial journey.

5.5 Findings – Section two

This section compares the responses of the Designer Entrepreneurs with the DECPI typology created in Chapter 1.10. The main objective is to test with empirical evidence, whether the theoretical DECPI typology has elements that are consistent or not with real cases of Designer Entrepreneurs.

As explained by Sarasvathy (2006), expert entrepreneurs present a tendency to work effectually at the beginning of their ventures, after all, they are exploring and learning from an environment where they do not have enough information to proceed. As it progresses, the actions become more causal to minimize the risk and expand their potential impact.

Literature showed that (Sarasvathy, 2001) entrepreneurs sought after the opportunity in the market and the value proposition of the venture by maximizing their given means and exploiting all the opportunities they could recognize. The early stages aim to identify, invent and explore new products or new markets niches. Nevertheless, as the data of the study shows, some entrepreneurs reinterpret the market and the product, shifting the direction of the venture towards a more meaning-driven industry.

On the other hand, designers use their skillset and their competences to configure the product, the experience and the interaction the user has with the product.

5.6 Effectual logic

5.6.1 Whom do you know?

All founder but F7 started their ventures with a relative or a close friend. They stretch out the capabilities within the team to keep the overheads down as much as possible. This led them to wear multiple hats at the beginning of the venture that helped them to have a more holistic understanding of their business.

> *"I asked my friend from uni [sic], if he wanted to start a business. He was also an industrial designer, but he was more interested in exploring consultancy for big firms. We partnered up and ended up working for start-ups" (F4, 2019).*

> *"…my CTO was involved in building the first browser on a mobile phone, you know it's not exactly the kind of person you just find across the streets… I would describe him as one of my best friends" (F2, 2018).*

5.6.2 What do you know?

This study can distinguish three types of knowledge; these are know-how, personal interest knowledge and experiential knowledge. The first type consists of having practical knowledge in the process. This means that the Designer Entrepreneurs have the know-how in the related industry or process. The other category corresponds to the knowledge coming from the designer´s personal interests, inclinations, and fascinations. This knowledge taps into the designer´s interest and hobbies to come up with new ideas or improving existing ones. The last type of knowledge considered in this study is experiential knowledge; this refers to the knowledge gathered by the entrepreneur based on personal experiences.

Founders 4, 5 and 10 started their companies in areas where they had know-how. In the case of founder 4, he had experience developing products for external brands, whilst one of the co-founders of founder 5 had experience designing with cardboard.

> *"They had different ideas, my cofounders selected cardboard as the main material because one of them was working in a cardboard box company, he had lots of experience and also he had access to the material quite easily" (F5, 2019).*

In the cases of founders 1, 2, 6 and 7, they had experienced the problem before. Founder 1 never designed baby products before but he had experienced having a new born baby at home three times. Founder 6 was an active user of stylus for digital devices.

> *"I knew that through my sort of background in advertising because I could come up with really nice brand" (F1, 2017).*

Founder 3 started his company in something he found fascinating. By the time he started his company, he had gathered years of information related to brands, trends and fashion related to trainers.

> *"...we knew that a further specialization was needed on each member of the team, that's why I joined the masters in footwear design… I could compare what I learned in the factory floor and the theory delivered in the classrooms. During the masters, a job offers to work for one of the biggest corporations in the footwear in Mexico came about…. In this job, I had to design entire collections*

of shoes, and travel to China to supervise the manufacturing process of them. This gave me a better outlook of the Chinese design and manufacturing process. They had the speed and openness to embrace new technologies and paradigms, which in Mexico I couldn't find" (F3, 2019).

5.6.3 What are you willing to lose?

Effectual logic describes how entrepreneurs look at the downside of an investment, what they are willing to lose in case this venture does not work. Founders 2, 4, 9 and 10 utilise the product as a way of learning. For them, in the case, this venture would not have worked; they could still use it as a learning platform. They could invest spare time and savings in this project that potentially would bring benefits either way it worked or not.

Founder 1 had a more impulsive approach. He quitted his job, being 40+ years' old and changed career paths. He believed in the project so strongly that he put all his savings into the development of the product. He was willing to sacrifice that.

"It was a massive step. Many of my colleagues at school thought I was crazy to give up a secure and relatively well-paid career in teaching. I remember overhearing my line manager saying, -He'll never be able to successfully launch a new product. That comment has really driven me on in the last few years" (F1 in CarrerShifters, 2018).

Founder 5 and his cofounders expressed that the cost of the materials and the time used to build the first prototypes was negligible, therefore they could experiment as much as they wanted. It was a very radical approach.

"They worked on that for a few weeks, they didn't have to put any money in, we had scrapped cardboard and the x-acto knifes from the factory, anyways, if we had to buy it ourselves, it would have been £20, so it was negligible" (Founder 5, 2019).

For founder 3, he did not have a job or any dependants, in his own words "I had nothing to lose and everything to gain" (F3, 2019).

5.6.4 What are your given means?

For this principle, this study considered the physical and economic resources as the means that the entrepreneur could tap into to set-up the company and build the product.

Founders 1, 2, 5, 7 and 10 had free access to workshops equipped with all the tools needed at university. This access facilitates the multiple iterations of the products; scrap material and leftovers helped them to iterate their ideas faster. This principle overlaps the Making-do principle from Bricolage (Baker and Nelson, 2005).

In terms of the economic resources, all the founders started with their savings. Founders 2, 4,6 and 7 went for a crowdfunding strategy before running out of money.

> *"Our biggest challenge was educating the UK what the hell Kickstarter was. You can imagine my mom's generation and being like: - so I'm not going to get a product for potentially months? - No. - I'm not getting it from your company? -No. -Well, why would I give you money now? - Yeah. It is a social phenomenon. You need to know other people did it and you need to feel like it is part of something" (F7, 2015).*

> *"There are parts of the story that can be told for a kick starter campaign that allow you understand what your customer want, rather than completely execute on a product straight away. With the right type of designers, you can be able to do a kind of "fake it before you make it" (F6, 2019).*

Founder 2 was the only one unsuccessful campaign. She was the first Designer Entrepreneur to run a campaign in this study. She claims that the platform was unusual for the public at that moment, therefore it was a double challenge to try to get support from this crowdfunding platform.

Founder 4 put aside money from his consultancy work to develop the idea until they attracted founds from the crowdfunding platform.

> *"The crowd funding campaign was a success, we raised more than £60,000" (F4, 2019).*

> *"During the crowdfunding campaign we got really good press. We had to work really hard with the factory in China to get the product out" (F4, 2019).*

5.6.5 Form partnerships

This effectual principle refers to the ability of entrepreneurs to see other companies competing in the same market as allies. This is, they find the way to complement their business proposition helping or forming partnerships with their "adversaries".

Founder 4 is a good example of how he formed a partnership with his competitors. In order to produce his first collections, he partnered with another shoe manufacturing company. He negotiated a good price for manufacturing his product in this company.

> *"We made an agreement with the manufacturer owners to let us produce our shoes in their "free time". Three hours on Saturday and/ or Sunday" (Founder 3, 2019).*

For founder 2, her product addressed the same audience as any other *IoT* product, however, she joined forces with them to raise the awareness of the *IoT* movement. This action benefited all her competitors and her business as well.

5.6.6 Co-creation of the opportunity

The Designer Entrepreneurs of this study except founders 7 and 10, did not consider the user´s feedback or opinions at the beginning of their enterprises. In the case of founder 1, 3, 4 and 7 utilized focus groups to validate their concepts, this is not considered co-creation though. Founder 7 and 10 followed the design thinking approach, where the user is right in the centre of the process from the very beginning.

> *"I had to start my final year and design a product from start to finish. I wanted to find the biggest challenge for city cyclists and tackle it, So about six months of that year was spent working with a ton of other cyclists, working with the driving psychologists working with the bus company in the council and being out on the roads myself… …once I did the deep dive I realized that actually, what was the real problem" (F7, 2015).*

5.6.7 Failure as a source of knowledge

In the design processes like the double diamond methodology described by the Design Council (2004) and design thinking described by IDEO (2004), the initial hypothesis has to be tested over and over again until a satisfactory result comes out of the process. They are not

considered errors, but the approach can be seen as a "trial and error". This allows the designer to find the most successful way to deliver value to the customer. This effectual principle can be interpreted as learning from trial and error. In industrial design, this is called iteration, whereas in business is called pivoting. Industrial design and business development can also make mistakes. The difference between mistakes and pivoting / iteration is that: the first one is not considered deliberately part of the experimentation. It might be an omission, miscalculation or confusion, or novice approach to industrial design or business development. Iteration and pivoting, on the other hand, are part of the product and business exploration, they are expecting a consequence of their exploration. Therefore, it is not unexpected.

Founder 1 experienced one late iteration on the product. After almost finishing the design for manufacturing of their product, they received a recommendation from a mentor that the aesthetics of the product might alienate part of their potential customers. They had to go back to the drawing board and make those changes. That mistake taught them the value of always having someone more experienced in the field on their team.

> *"There was a stage in the development of the product where we thought we had a really strong product, distributors loved it. Then it was suggested that the product looked a little bit too masculine. It would quite possibly put off women… We then, realized that needed to quite radically change the design" (F1, 2019).*

Founder 2 had multiple problems with the case and the hardware of her product. To design the case, she had iterated several times to meet the manufacturer requirements and her visual aspirations for the product. In the other hand, she had to re-iterate the product based on recently launched telecommunications technology. A big mistake she made when she looked for backers in her crowdfunding campaign. This new way of looking for seed capital was in her early stages, making it more difficult for her to educate the market about her product and also about a crowdfunding platform. The lesson she learnt was that it would be more complicated to raise awareness about a new product, for a new market and on top of that, educate people about a new platform. Another mistake she experienced was hiring unqualified personnel, she learnt that experience has a price but also great value, young people can add enthusiasm to the company, but they demand much more time to get them up to speed. This is a big mistake because time and money are something scarce in a start-up.

"We launched a Kickstarter campaign at CES, both of those ideas were absolutely terrible, because CES was a great idea if you already had a commercialized product and it was a great idea for USA PR purposes. The problem is that we were not sold in the US, we were not available and trying to raise a Kickstarter money in January after everybody has paid their Christmas gifts is the worst idea ever. But crowdfunding was very new and there was not a lot of knowledge around this platform so I did the mistakes that I have to make in order for other people not to make them afterwards" (F2, 2018).

Founder 3 had to adapt his designs to what the factory could do and the available materials they had. He modified his designs to try to make use of the factory without disregarding the aesthetics of his prototypes and the collection. The business and manufacturing constraints left him little room to manoeuvre in designs terms. He had to learn to be fast in adapting his design proposals to the availability of resources.

"We developed our relations with the manufacturers but still, our production was small. We had to adapt to the materials and processes that other bigger companies were using for their collections. So we had the materials beforehand and started our collections from there, adapting our designs to what was available" (F3, 2019).

Founder 5 had multiple pivots and iterations. Product-wise, they tried different ways to assemble the furniture. To minimize the cost and the time of assembly, they run multiple iterations of the products to find the perfect fit. Also, they experimented with different cardboard suppliers to find what width could give structural support for their designs. For the business model, they had a pivot when they realized that their primary consumer was not a low-income student but a middle-income professional. They had to change their strategy and their sales pitch.

"After some months [of selling] we realized that our clients shared some [demographic] characteristics. They wanted to have something unique in their home or in their offices. More open to explore and without the concern of money [..] the profile we´d pictured was wrong" (F5, 2019).

Founder 6 ran more than one hundred iterations of the product. He learnt by doing and by trial and error. This let him experiment with the material, the technology at the pen´s point and its portability. In terms of business, he did not change the original idea to sell it online and in retails. The only considerable change was the size of the market, it turned out that it became a hit for tablet users after seeing a technology famous founder using his device in a keynote presentation of a new tablet. He had to scale up the production and renegotiate the distribution and logistics to expand it worldwide.

> *"The design process involved over 100 iterations to create the most effective and efficient stylus" (F6, 2019).*

For founder 7 the biggest mistakes she experienced was when she launched the crowdfunding campaign in an inconvenient time. She learnt that timing when launching a product can be essential for getting a successful campaign.

> *"We made a video and edited it in 36 hours. We wanted to get out before Christmas, so he wanted to have it up a month before Christmas. We managed to get it done in time and blasted over to Kickstarter. Got no response, got no response, got the response and we didn't remember that it was Thanksgiving in America so it's not going to get approved for three days, and we had to start four days late" (F7,2019).*

5.7 Bricolage

As suggested by Baker & Nelson (2005), bricolage can be described as *"making do by applying combinations of resources at hand to new problems and opportunities"*. The data was reviewed considering this theory and the findings were organised using the variables of this theory as headings: Scarcity, making do and new combinations.

5.7.1 Scarcity

In the bricolage theory, scarcity of resources allows the entrepreneur to focalise his creativity and find multiple ways to overcome difficulties.

All the founders shared the fact of limited budget whereby they concentrated on attracting capital or investors to their venture. For founder 3, the minimum number of pieces the manufacturing plant could produce for him was 100 pairs. The inventory quantity had to be

handled meticulously due to all the different sizes they had to produce. This meant that he had to buy the material and pay the rent of the conveyor belt in advance and have a gap for any quality error. They financed the first productions with their own money. As a result of this adversity, they learnt how to be flexible with their collections and have multiple scenarios for the upcoming fashion trends.

In the case of founder 5, the material was not expensive, but it was easily damaged. At the beginning of the start-up, it used to be a time-consuming and challenging process. This issue made them focalise their efforts on how they could automate the process and make it more efficient. As the business progressed, their lack of business training became more evident.

> *"We did everything by hand, but there was a point when we had to look for more efficient ways to make our products" (F5, 2019).*

For founders 7 and 2, they did not have the right amount of experience, her knowledge in business was minimum and they did not have any practical design experience. As a result of that, they learnt how to bring people on board, and ask as many questions as possible to more experienced designers or business people to sort out setbacks or areas of inexperience.

> *"My talent is in having a really strategic view of what needs to be done, the willingness to engage with other people to make it happen, the organizational skills to make things happen, more or less at the time they need to happen so they tend to be much more managerial skills and much more about who do I need to talk to? And how do we make this happen? Where is the technical skills?" (F2, 2019).*

> *"I got as much free advice as I could get my paws on" (Founder 7, 2015).*

For founder 2, her main pivot happened when she had fired her entire team. She stopped for two years to allow the technology to evolve and the market to recognize the *IoT* devices and their capabilities. This stoppage made her rethink the technology behind the telecommunications of the product and redefine the potential customer and target clients. She changed the business model because of that.

"I had to sack my team at that stage, we couldn't find any money so I think we've just waited until 2014, when I was able to find a company to outsource to. We met with Company X1, who acts as our hardware manufacturer and our back-end not back-end but communications provider, we start to manufacture a small batch of 300 units which we then sell in, 2015" (F2, 2018).

5.7.2 Making-do

This principle refers to the ability to work out setbacks with limited or inadequate means available. There is a homologous principle in the effectuation theory called "Work with your given means". Both principles refer to the ability of the entrepreneur to come up with a solution to tackle the challenge by utilizing whatever is at hand.

A good example of this principle comes from founder 3. When he had manufactured his collection "making-do" with the materials, expertise and machinery available in the factory.

"I believe that a designer-entrepreneur has to adapt, it has to be very creative to utilize what it is available, and what can be done in time, budget and processes. Using available resources gave us "looseness" in the budget, time and flexibility in the manufacturing processes" (F3, 2019).

5.7.3 New combinations

New products can emerge after combining two different elements, characteristics or attributes from different products into a new, unexpected one. In the same line, combining different business practices can be a way to innovate the business model of a company. Bricolage theory explains how these elements, usually come from previous projects intended for different purposes.

For the co-founder of Baby Sleep, he came up with a rough prototype after digging in into his garage, putting together different electronic scrap and testing if that gave him the effect he was after. This new combination opened the door to the Baby Sleep product.

Founder 2 combined the brand-new opened hardware platform with a traditional on-off switch to create the foundations of the Device Connected product. After she stopped the business for the first time, she ran an *IoT* consultancy business for seven years. Once she decided to retake the Device Connected product, she brought back all the knowledge gained from the consultancy business. She developed some integrated communication devices for previous projects, which later on, she implemented into the Connected Device product.

5.8 Causal Logic

As described by Backer et al., (2003), casual logic refers to the process in which the entrepreneur will aim to plan activities and make them happen. The data were reviewed to identify if designers present the elements described by the theory. The variables of this theory were used as headings to categorise the findings: pre-set goals, expected return, competitive analysis and avoid contingencies.

5.8.1 Pre-set goals

There is an expectation of achieve preselected aims. Contrary to the effectual principle of starting with the given means, this principle starts with given goals. The Designer Entrepreneurs participating in this study did not have a clear idea of the business at the outset.

Founder 1 and 7 made their business plan to have access to potential investors. In the case of founder 1, it took more than one year and a half after starting up the company to integrate a document similar to a business plan. For founder 7, she won a product design competition which gave her the price to go to one of the best universities in entrepreneurship in the world. They help her out with the business plan.

> *"We will be looking for investment shortly, our first seed investment and we've got to make sure obviously we have a business plan for potentially investors- Two years after starting the company-, but also making sure that we don't take eye off the ball" (F1, 2018).*

Founder 2, 3 and 5, they came up with the business plan long after selling their first product. They did not have any business background. Founder 2 kept the business model as simple as possible, she just wanted to make enough money to pay the bills and be able to continue improving her idea.

> *"It´s very simple for us, which is we sell units at for more than they cost us, that's it, that's the business model, there's no intention to sell data or anything like that" (F2, 2018).*

Founder 3 experimented with multiple business models, making challenging to write down a business plan. He cared about making enough money to be able to break even. Founder 5 had a simple way to charge their customers; they just charge twice as much the cost of the material used

and a percentage for their time. That was their business model for the first year. Founders 4 and 6 had a more structured business model since both of them asked for money in crowdfunding platforms. They had to know the details before putting their pledge on the platforms.

It is inferable that for most of the Designer Entrepreneurs in the study, having pre-set goals was not essential or at least considered at the beginning of the venture. One factor that seemed to change that trajectory is the need to ask for money in a crowdsourcing platform, due to the regulations.

5.8.3 Expected return

This causal principle is associated with comparative analysis and calculation of the best opportunity. This principle seemed to appear once the start-up needed to make critical decisions.

For founder 1, they had to compare the cost of manufacturing in the UK or China. UK manufacturing would give them kudos in the local and European market and keep a closer look to the quality versus manufacturing in China, which could reduce the cost of the product significantly and facilitate the worldwide distribution.

Founder 2 had to follow a more casual approach when she had to select the service provider and the protocol for the communications of the product. On the one hand, she could use a device that had been proven by many, cheap and robust but with the limited remaining time available in the market or on the other hand, adopt a new technology which at that moment was not robust, but experts mentioned its potential in the near future.

> *"The fact that I wanted to be able to build something like the DEVICE CONNECTED using tools like the open hardware platforms, but I could see that no one was using those tools apart from the odd academic environment here and there, but you know, there wasn't a lot going on" (F2, 2018).*

Founder 3 shifted to a more casual approach as well when he increased the number of pairs of his collection. He needed to negotiate a better deal with the manufacturing company. Hence, he broke down his operation to find potential savings and increment his margins.

Founders 4 and 5 ran a crowdfunding campaign for their products. Therefore they needed a clearer vision on the margins and potential profit they could have before uploading their campaign online.

5.8.4 Competitive Analysis

A competitive analysis of the market shows the opportunities for the value proposition of the product and the company, as well as the unattended niche sectors. For founders 1, 2, 3 and 5, the competitive analysis came after building the product and setting up the company; they did not consider any competitive analysis of the market to configure their product. They wanted to build it and adapt to the circumstances.

F4, F6 and F7 had to consider the competitive analysis almost in parallel to the configuration of their product.

F4 came up with the idea after doing market research for a client; this was the beginning of the product, so indirectly, she did a competitive analysis before configuring the product.

F6, as mentioned in (**page 186**), had indirect market research after trying many styluses available in the market. He knew the point of purchases, their strengths and flaws, the price point and the opportunities in the product.

F7 had to research all the bicycle lights available in the UK market. She did a comparative analysis before setting up the business and receiving investment from the crowdfunding platform and private investors.

5.8.5 Avoid contingencies and inevitable future principles.

These causal principles refer to the need for reducing the uncertainty by predicting the future. The better you can predict the future, the more you can control it. Accurate prediction and intense focus on business plans are part of these principles.

All the founders in this study started developing their product without any business goal in mind. They did not show any evidence predicting their future or forecasting future sales. They started without any clear business goal or plan. Founder 1 tried to negotiate with the manufacturing company in China a good deal when he realized that he needed a clear plan to deliver the production goals. F2, F4, F6 and F7 participated in a crowdfunding campaign that required them to specify how they would build the product and deliver it to the backers if the project reaches the funding goal. F3 wrote a business plan when he needed to increase the size of his collections and negotiate the manufacturing with his manufacturing partner. To justify the investment in expensive machinery to automate the process, F5 started to use a more predictive business approach. He asked for a business loan, and it was part of the requirements.

5.9 Design Thinking

Razzouk and Shute (2003) described design thinking as "an analytic and creative process that engages a person in opportunities to experiment, create and prototype models, gather feedback and redesign". The essential elements of Design Thinking (described in Chapter 1.7.2) were used as headings for the reviewed data. However, the ones that did not match with the data were dismissed. The remaining categories are the followings: human-centred methodology, systemic vision and visual language.

5.9.1 Human Centred Methodology

Human-centred design is a problem-solving methodology where the emphasis is on iterated observation of the human actions and behaviours and his interaction with the context. This is followed by an iteration phase where trial and error help to refine the prototype and finally testing the idea with the user to validate the product or service. This process is suited for incremental innovation and unlikely to lead to radical innovation (Norman & Verganti, 2012).

F7 was the only one to follow a structured design methodology. As she was studying her final year at university, her professors asked her to follow the human-centred approach. As a result of that, she came up with the product idea after deep-diving into the problem.

F4 did research about male hygiene and behaviours for another client when she spotted the opportunity; she did desk research on hygienic items used by man. This was not following any design research methodology in particular. It was just gathering information on available products.

The rest of the entrepreneurs did not follow an explicitly a human-centred methodology. However, they use some of their tools at different moments.

5.9.2 Systemic vision

F2 was a pioneer in the *IoT* sector. The *IoT* ecosystem was relatively new and scattered back in 2006 when she started her company. She wove her stakeholders and early adopters into a network capable of providing her information, knowledge and potentially financial support. As a result, she gained a systemic vision of what was the latest technologies and uses of the open hardware.

5.9.3 Visual language

Designers have among their skill sets the ability to communicate their ideas through sketches, they use imagery to recognise upcoming trends, and maps and diagrams to make sense of problems. All the founders expressed their tendency to communicate within their teams.

Besides the product, the aesthetic acumen of all the funders in this study, combined with their visual thinking and ease of creating imagery helps them to create their website, brand, logos, advertisements and the videos for the crowdfunding campaign at the outset of their ventures.

For F1, Customers expressed the way he integrated the brand, the slogan and the shape of the device as "witty, and with a touch of banter". This helps the brand to be easily recognisable. Once his company had a track in sales, and the manufacturing and distribution sorted, he reached out a crowdsourcing platform to get the funds for his company and not his product. The way that he created the explanatory video to get the funds from ordinary people (no professional investors) was very visual, taking advantage of his knowledge in design.

For F3, the best way to persuade his co-founders was to turn up to the meetings with storyboards, sketches, renders, mock-ups and different visual scenarios. This strategy helps him to convey a clearer vision of the company, thus bringing a can-do attitude from his colleagues. For his customers, his strategy was to sell the streetwear lifestyle through videos and Facebook post, without making explicit the shoes, it was more to bring them inside the world he wanted to create.

F2, F4, F5, F6 and F7, ran crowdfunding campaigns, where the visual message had to be clear and capture the attention of the potential backers. The visual approach is crucial in this action. The ability to produce high resolution renders and infographics persuade the shareholders and backers to support the start-up.

All the entrepreneurs mentioned that visual thinking formed part of the everyday business operation.

5.10 Strategic Design

5.10.1 Build brand image and enhance corporate reputation through design

As mentioned in Chapter 1.2.2, design can be used to express the brand values to its different audiences, and also make the strategy visible. The reputation is the set of economic and noneconomic attributes ascribed to a company that is inferred from the company´s past actions. It is an intangible asset to participate in prestigious design contest (Borja de Mazota, 2013).

In the case of founder 1, contest and international awards were key to build brand reputation. He started to participate in these contests with just the working prototype. By participating in these contests, he received feedback from industry experts who let him and his team iterate the product and develop the business strategy. More benefits from these contests were that he had access to capital and mentorship. He increased the awareness of his product, and at last, he obtained international free press coverage. He also gave lectures and participated along with other entrepreneurs in public events to have the chance to talk to a broader range of people. As a result, he met other entrepreneurs in developing baby products. He, later on, joint efforts with those entrepreneurs to raffle their products in social media and be able to cross their audiences.

F2 organized a series of talks and meetups related to the internet of things. This was the best way for her to make her product known. She iterated the product multiple times after meeting people involved in product and software development.

For F3, he needed to differentiate his products from the available renowned brands in the market. His strategy was to create unique styles that had limited production, to allow his customer to have a product that could stand out for his originality.

F4 participated in a design contest to give her product a boost of notoriety. She knew that her main clients would come from a design community. Therefore, an award supporting this product could be regarded as reliable.

F6 worked on his prototype and the design for manufacturing before running a crowdfunding campaign. This crowdfunding campaign gave him the validation and the funds to manufacture the first batch of products. The number of days that the product took to raise the money, and the amount of money raised at the end of the campaign are to raise the hype about the product and gaining more recognition from the potential customers.

F7 participated in a product design contest before launching her product. She utilized this as a part of the story of her entrepreneurial journey when she launched her camping on a crowdfunding platform.

Due to the size of the company, the faces of the entrepreneurs are common to see on websites, contest and their content for social media.

5.10.2 Influence purchase and emotion

Design principles influence consumer decisions and predictions. The product has been designed to produce an effect on the perception of the user. According to (Borja de Mendoza,

2003) design principles influence the form of an object and the aesthetic response that the consumer has towards the product. Founders of this study utilize this aesthetic acumen to evoke different feelings and emotions from the users and stakeholders. Aesthetic acumen helps entrepreneurs to discovery market niches and support market segmentation. It also can reduce the complexity of high-tech products for consumers who prefer products with simplified functionalities (Feldman, 1995).

About the masculine shape of the product:

> *"You know that was quite a lesson, it's quite hard to swallow, basically something you've lived with for nearly a year and almost everyone was saying it was great, then there was the seed of doubt whether it would appeal as much as we hoped it would to our target market and we then went back to the drawing board, it was very important because the function was exactly the same but there's the styling of it changed radically…" (F1, 2018).*

For founder 1, the product needed to depict the brand and the slogan. However, the name of the product could be easily related semantically to a boy´s toy. They had to go over the drawing-room to prevent an adverse reaction from moms that could feel alienated by the masculine shapes of the product. They did it more neutral for both moms and dads. The colour pallet chosen for the brand identity and the product averted blue or pink, which in western cultures are still consider masculine or feminine. The shape of the device played with the proportions to make this device look playful rather than a technological one.

F2 designed the case of the product following the idea that hand-made wooden cases could make the product to be seen as unique and artful, rather than consider another plastic gadget or device that could be easily disposable. She wanted to evoke the feeling that this technological device was one-of-a-kind, made of mindful materials that could easily match home environments because the visual product language did not deploy any technological allusion.

For F3, he influenced the purchase and emotions of his clients using social media post, videos and entry blogs. He and his co-founders were aware of the latest international fashion trends and what was not available yet in the Mexican market. They used the catalogues of international brands as a source of inspiration, matching them with the cultural perception of images and colour

of the Mexican market. They also set up their physical shop using all the symbolisms that the streetwear culture had.

F4 the challenge was that multiple other products were filling the need for shaving. They were more efficient in time and less risky. However, she decided to design a premium object, relying on the selection of the materials, the minimalistic shape and its packaging to give a sleek look of the product. The social media posts were crafted carefully to represent the start-up ethos, which was the attention to detail, less is more and simplicity. This post played a major role when they needed votes for the design contest they were at. Followers liked the brand, and even though they wouldn´t buy them themselves, they showed an affinity with their design principles and aesthetics. They allow their followers to see their previous projects and collaborations, making the company look more solid and experienced than what it was.

F5 and his co-founders realised early in the process that the novelty of cardboard could be the most iconic symbol their brand had. They came upon the fact that for some of their consumers, the visual impact of cardboard furniture was positive, whereas some others related cardboard with rubbish. They took care of the visual message their products depicted. It was very important for them to show a sleek product with high-quality workmanship.

F7 created videos to show all the multiple cases where this invention could save the user´s life. Being the winner of an important international contest help her to build the product reputation, thanks to that, she started to appear more in social media. This made stakeholders relate her face with the product. Every presentation and talk gave her the chance to increase brand awareness and product reputation.

5.10.3 Enable strategy/enter new markets:

Design helps visualize the business strategy and engages stakeholders by sharing the same vision and clarifying the goal. To enter new markets, design craft the product, its communication, interfaces and experiences, to let users understand its purpose.

Designer Entrepreneurs in this study started their companies having no specific strategy in mind. However, they utilized design actively to reach out their customers and absorbed all the information to develop a pertinent product/business strategy.

5.10.4 Increase customer satisfaction and develop communities of costumers

New products require early adopters that can give feedback to the entrepreneurs, offering support in social media and crowdfunding campaigns.

For F2, the development of the community became a crucial task in her business. She managed to engage more than 10,000 people interested in *IoT* in the UK. Her first users were tech enthusiast, academics and makers interested in exploring the potential of the new *IoT* type of products. She used design to create scenarios for the technology and to show all the potential that it had. People signed for the chats, conferences and to meet up more people involved in the use of open hardware platforms. This interaction with a vast community gave her the opportunity to be selected as a part of a permanent exposition in a significant museum in the UK. That gave her start-up recognition and validity.

> *"I have been running a meetup in London since 2011, we ended up growing the group until we're now the second largest meetup in the world. It´s a meetup that provide talks and networking" (F2, 2017).*

One of the downsides of the community is that they might not give honest feedback. In the case of founder 3, he presented to his closest network his first collections which were welcomed positively. However, once he tried to sell the product outside his network, he faced a different reaction from people. People expressed the quality of the trainers were not as good as any international brands, and they looked like a copy of them. He learnt the lesson, and for his next collections, he paid attention to the details in manufacturing to increase the perception of quality in his collection. He used design to differentiate his collections from the best brands and have their own style.

For F4, F6 and F7 they formed their community in a crowdfunding platform. This network interacted constantly with them. The support they received from people help them understand what they wanted from the product and from the brand. They kept informing them about the progress and delays of the product.

5.11 Industrial Design

The data was reviewed and compared against the elements on the DECPI typology. In the case of Industrial Design, the data was organised in headings such as aesthetics, function and manufacturability.

5.11.1 Aesthetics:

The Aesthetic of a product is influenced by the shape (geometry and form), composition (arrangement of different elements of the product and their proportion) and physical attributes of the product (such as colour, texture, lighting and material). This term is used to describe the appearance of a product. According to Pham (1999), style, fashion, taste and originality are connected with this term as well.

Baby sleep changed the shape of the product based on a comment of an industry expert referring to the shape of the prototype as a "masculine-looking product". They were not aware of that since they were an all-men team. However, they immediately went to redesign the appearance of the product to avoid alienating moms.

Device connected carefully selected the materials of the product to convey the right message to its customers. The colour of the light and the textures included in the product expressed the value of craftsmanship even though the product is technological.

F3 designed his trainers and its collections based on personal taste. He got his inspiration from North-American brands. He attentively arranged the composition of the collections having in mind the resources, techniques and processes he had at hand.

Shaving played with the shape and the visual attributes of the razor to improve the functionality of the product. She chose the materials to express minimalism and freshness. She wanted the user to experience the sensation of having a brand-new product every day.

Sitbox utilized unusual material to capture people's attention. It was such an uncommon material to design furniture with that made customers love it or hate it, but they spoke about it.

BikeLight played with the product's light to convey the message he wanted divers to see. It was to get attention and warn drivers about the presence of a cyclist on the cycle route.

5.11.2 Function

Baby Sleep wanted the user to have a product “plug and play” and adaptable to all the prams and pushchairs available in the market. They selected the clamp system to be compatible with any handlebar. They wanted to have rechargeable batteries inside the product. Still, the time to validate the charging port for a baby product would have taken more time than what they were planning to spend on designing.

Device connected deliberately minimized the functions of the product to allow the user to give the product they used that better fits with their lifestyle.

Shaving had the challenge to innovate a product that had an established clientele in a market with minimal changes over the years. Her approach was to improve the way to change the blades, making it safer and faster for the consumer.

PenTronic improves the function of the previous styluses. It attached a detachable point at the tip of the device to allow the product to evolve accordingly to the improvements in the technology.

BikeLight combined the function of a torch and a laser to improve the safety of the cyclist, not only at night but at any time of the day.

5.11.3 Manufacturability

All the participants had to work on their design for manufacturing. Having the same background as industrial designers, their expertise was minimum designing for the manufacturing process.

F1 and F2 expressed their need to know how to design for manufacturing. F3 had to learn in both, classroom and at the factory, to be able to become better at designing with a manufacturing process in mind.

5.12 Findings- Section 3

This section identifies the new themes emerging from the data, which were not accounted for the initial framework DECPI. Following the constructivist grounded theory model, the process of coding used the data from Phase Two data collection, leading to six new emerging themes: Mindsets, Origin-of-idea, shared similarities, product-business-individual timing, authorship and passion. These will now be examined in turn in more detail.

5.12.1 Mindsets

A recurring theme in the data was discussion by DEs about moments where they recognised something had to change. They could not keep doing what they were doing. In particular, this often related to relinquishing some of the focus on the product at the centre of the enterprise to zoom-out and see the needs of the whole enterprise with fresh eyes. These triggers seemed to be the moments when the outlook or the mindset of the DE´s evolved. This idea of change in mindset had not been identified through the literature, and so had not been accounted for the preliminary DECPI typology framework. As such, it provides a new lens through which to view the evidence from the study to understand the journey of the designer to Designer Entrepreneur.

The concept mindset refers to the set of assumptions and habits of thinking, held by one or more people (Cambridge, 2019). Contrary to the conceptual paradigm that refers to the patterns of behaviours and rules, the concept mindset refers to the way people think. In the same manner, the study shows four new different classifications for Designer Entrepreneur´s mindset concerning their practice and start-up. To identify these mindsets, the researcher concentrated on assumptions made by Designer Entrepreneurs and the tasks that they invested more time and energy in, and what they placed importance on during the interviews.

5.12.1.1 Artisan Mindset

Phase Two participants were selected for the study because they had been designers and practice design in an industry or because they were design-trained at university. Before thinking about the transition to more business-oriented ways of thinking, it is useful to consider the ways the participants think prior to them embarking on their own enterprise/start-up. This means characterising their mindset as designers. For the study, the researcher will refer to this starting state as the artisan mindset, whereby the designers concentrate effort on applying skills and knowledge through their practice.

As a mindset, it is one where the practitioners find satisfaction in the process and enjoy experimentation with materials, making-process, meaning and form. Through this focus, they can rehearse and demonstrate their mastery in execution, taste and technique.

> *"At the beginning I could work 12hrs straight, from my bedroom or at a coffee shop. I could design the whole day" F4.*
>
> *"I had all these creative thoughts, I felt inspired with every sketch, and every fabric I got my hand on. I was hungry to learn more. I was inspired" F3.*
>
> *"I could watch tutorials all day long and the next day try new techniques out" F3.*
>
> *"We did not have a pricing strategy, we just loved experimenting with the material. We just charged twice the cost of the material" F4.*
>
> *"I loved tinkering with this new cool tech I have in my hands. I knew this was going to be ground-breaking" F2.*

5.12.1.2 Configuration Mindset

The creativity unleashed in the previous mindset diminishes once Designer Entrepreneur concentrates his attention on one single object. This creates the ground bed to start thinking about what else they could do with the product, and it might be a good idea to create a company out of it. In order to configure the product, they bring friends and family on board. There is constant learning on how design informs the rest of the team and how other areas of the start-up influence product development. The way they learn new things is by trial and error.

> *"One night I asked my friend to join me, he´s a graphic designer interested in fashion editorial, he was ready to come with me the next morning" F3.*

> *"It was a very practical approach, I wanted to learn from the people doing things, we took the bus to Leon* [a Mexican city well known for its vibrant footwear industry] *and once we got there, asked people where the factories were" F3.*

> *"I had a vision of the product´s functions and looks, that helped me prototype it, even though it took me more than 100 iterations to get there" F6.*

> *"There is no deadline, that´s why you can have loads of iterations" F4.*

> *"We did everything by ourselves for the first 18 months, from the packaging to the website until we realized it might be good idea to ask someone with expertise in the industry to give us some feedback" F1.*

> *"Since we did not have any track record of who our customers were, we had this belief for almost a year, we had misinterpreted who our customer was" F5.*

> *"We got the grip [sic] of the technical side of the company, but we hadn´t got the grip of the business side, like the price, the cost, the distribution… we couldn´t recognize that we had a steady increase in the demand of certain products because we did not have any data" F5.*

> *"I hired people without any plan, I knew I needed them but at the end I had to give them the sack because they did not have a specific task" F2.*

To portray this mindset, F2 was selected, which is the one who has been out there for longer, nevertheless, she has expressed exactly why she do not want to grow.

> *"you could write a book on the things I should do better. I would fault my lack of ambition… we probably could have done more if I was more dedicated in terms of my time and my energy" F2.*

> *...I wanted to work with the people that I really loved working with, which I continue to do, and these are very slow organic food type values, you know [sic] […] it's not a kind of fast paced low-quality, go, go, go [sic] kind of values and you could see that as being a problem with my way of working" F2.*

Similarly, the beginnings of F5´s enterprise/business was surrounded by trial and error. Their lack of business acumen made them focus on the development of product lines that were not successful, and sales strategies without any metrics or control.

F2 recognized that her lack of focus and ambition keeps her in a more precarious business, referring that her company´s sales do not demand her to scale up their production or to fall back on a far-flung manufacturing partner. For her, that was a personal choice.

5.12.1.3 Opportunity Mindset

In this mindset, DE´s realised that their main goal is to keep the business alive and make it grow. The main concerns are sales and distribution channels, form strategic alliances with suppliers and manufacturers and obtain mentorship.

There is a better understanding of the gatekeepers in the business. There is a constant lookout for potential sources of funds, mentorship, recognition, validation and diffusion. Their role shift towards the sales, gaining speed and improve the cost/price ratio. They use every aspect of the product, company or individual as leverage. This includes the personal network, the skills, the community and the stories to create a reputation and a name.

> *"I realized we were business people, we have to check the market performance of our product… When the product didn´t hit the sales, we realized it was time to do something…. We needed to reach out for help" F1.*

"We had to come to terms with the middle man and distribution points to increase our sales, we needed to expand our roles, roll up our sleeves and get our heads around areas we did not know anything about" F3.

"We spent time with the retailers, with the middleman, the sellers. They were responsible of getting our production on the sales floor, we listened to them" F3.

"If you are selling online and offline you need two completely different strategies… if you are selling offline you need to address the retailers and people in charge of purchasing your product and getting it to the sales floor" F7.

"it took me several months to establish the roles and tasks of each member of the team… Once I broke down the process into tasks everything became clearer, I could stablish each person´s role according to their skills" F4.

"We didn´t design for awards, it is good to have them, but it is not our main goal" F2.

"Our creativity is not hindered by the business model, but certainly it is a great help to save time and be specific with your targets" F6.

"We have different stories around the product and the start-up, however the one everyone seems to relate is the three dads inventing something for their babies […] that seems to resonate with everyone no matter the country" F1

F1 participated in as many contests as he could, at the beginning in regional events working his way up to international competitions. F1 tapped into them to promote his brand and his product, get free press, free mentorship and access to funding and to trade shows. It also helped him to build reputation and a track record of prizes that later on helped build the reputation of the start-up.

"People liked we were young and innovative, we appeared on radio and television, they liked we were a role model for designers" F5.

F3 built up a personal network with industry insiders who shared with him valuable insights on the sector and how to navigate the manufacturing, suppliers, middleman and retailers'

negotiations. His experience working in China and his ability to bring that knowledge back to his company helped him to reduce the costs and increase the margins of profit.

F5 experienced the transition from the configuration mindset to opportunity seeker mindset. Under it, he saw the opportunity to automate his processes by adding new machinery to their workshop. To make this happen, he needed to ask for a bank loan and other government grants given to young entrepreneurs. This motivated the team to create a business model and a business plan. The creation of a business plan helped the start-up to reduce the inventory of products, focusing on the ones that produced the most significant sales, something they had not done until then.

5.12.1.4 The design-leader mindset

Previous data from Phase One data collection helped to build this mindset. A set of companies led by industrial designers were used to build this case. Former Designer Entrepreneurs turned into a successful business people to help differentiate the opportunity mindset to the design leader mindset. The personal traits shared between these two experienced designers are different from the ones shared among participants in Phase Two data collection. Successful designers transformed into businesspeople were challenging to track down for the study. Therefore, this mindset is relying only on a brief interview and in secondary data to conclude it. However, there is a clear distinction between the Designer Entrepreneur´s mindset and the designer leader mindset. A further study needs to be made to discover what potential variables make this distinction in attitude, behaviour and logic, but this is outside of the reach of this study.

5.12.2 Plasticity of the Mindsets – the triggers

Ready for a change, recognition of "we can´t keep doing what we have been doing" sort of speak.

5.12.2.3 Trigger to jump to the next step - Artisan to Configurator

"I thought it was time to ask for a patent once we figured out how to rock the pram in a way we were satisfied. It took a lot of effort, but after playing with all the configurations possible, we figured that out" F1.

"We now need to see if people react to it the same way we do" F6.

5.12.2.4 Trigger to jump to the next step – Configuration to Opportunity mindset

"We either need to stop doing it or we just put it out there and launch it" F4.

"Just ship the damn thing! [sic] Sort of attitude" F2.

"We needed a loan to ask for money to buy a laser cutter machine but we did not have any business plan" F5.

5.12.3 The origins of the ideas

At the outset of this study, one of the hypotheses was that the idea came from a human-centred process, where observation was mainly the origin of the idea, yet, the data suggested that the idea came from different places. This section explains how the idea came about for the entrepreneurs; in some cases, previous experiences were the main source of inspiration to come up with a solution that was worthwhile pushing forward. In the case of F3, passion for fashion, footwear, and design made him take that leap. For the F7 case, following a formal methodology took her to discover the product/business opportunity. In the case of F4, she took over a dismissed idea she found for her client. She could glimpse the potential market opportunity that the product might have. In the case of F5, the hands-on exploration helped his cofounders to discover new ways of using traditional materials in an original context.

5.12.3.1 Previous or current experiences

F1, F2 and F6 came up with the idea after experiencing the problem or challenge by themselves.

In the case of founder 1, his co-founder came up with the idea based on his current situation of sleeping deprivation. One night he came back to his place and at 3 am. He put together some electronic scrap and came up with a rough prototype of a potential solution for his problem. He tested it with her daughter, and it worked. In a family meeting, Founder 1 heard the idea; he immediately saw the opportunity that this product could be a hit among parents since he is a father himself of three children. F1 told his brother-in-law to band together to create a prototype. He was not planning to have a business, but he felt enthusiastic about the idea, and one week later, he quit his job. Based on his previous expertise as an art director in a marketing company, he could see himself doing the branding and the design of the product.

> *"My brother-in-law invented the concept for the Baby Sleep, so basically he had a daughter who was three months old, she just refused to sleep at all, unless it was being pushed and was incredibly frustrating. He had a background in engineering, a PhD in vibration and acoustic. One night he came down to the*

garage and start putting together bits and pieces as an early prototype…" (F1, 2017).

For F2, she was experiencing a nomadic way of living, making it difficult to keep herself in touch with her beloved ones. She was experiencing having friends and family in three different countries and having to move away constantly. In her case, she was given a brief at university "In the future, more people will live alone. Design something for them". Her product was the response to this challenge. She resonated immediately with this issue, and the idea came up after thinking about her own experience. It should be emphasized that her ecosystem was the early open-source hardware and software platform that originated in Italy in the mid-2000s. She was playing and doing some test with this platform when this brief was handed out at university. It was easy for her to find the way how this new tool could easily help her with her product.

"… and really also triggered by my own experience which was living in Italy with my father who was quite ill at the time and my mother who were still in Canada so my mother would try calling me the weirdest hours ever because she didn't just couldn't get her head around when you know might be the right time" (Founder 2, 2017)

For F6, the idea came up after trying more than ten different styluses for his electronic tablet. He was frustrated by the latency of the current devices and also the lack of portability. The available styluses were easily lost and could not be attached to the tablet or its case. He prototyped many different ideas until he finally came up with a satisfactory prototype. The idea to set up a company came after finding the way to sort the lack of portability, the lack of accuracy and latency issues.

"I had the idea right after buying my iPad 2 and after dealing with huge frustrations with the experience other stylus deliver, I needed something that is attached to the screen without the risk of scratching it… the latency was also an issue" (Founder 6, 2019).

5.12.3.2 Passion

For F3, to come up with the idea was relatively simple. He has been in love with trainers and streetwear all his life. He decided one night that he wanted to create his own company. He

thought for the most practical way to start this venture and the next day took the bus heading to a city famous for its shoe industry. He asked his friend to join him. He was also into fashion and streetwear. Once they got in the city, they started asking people where they could buy materials and tools to produce trainers. In this case, F3 did not conduct any market research; he did not spot any gap in the market or recognized any fashion trends changing. For him, it was the driver of designing something he felt passionate about it and exploring what he could do with his given means. F3 started doing what he believed was plausible and doable. He brought people on board based on personal affinity and shared preferences.

> *"Ever since I started high school, I was fond of cars and trainers. When I started Uni, in the industrial design course, I realized that mobility was my main concern. I always loved shoes (trainers), so I pondered the idea of designing shoes or going to Italy to study automotive design" F3, 2019.*

5.12.3.3 Formal methodology

For F7, the idea came after following a human-centred design process at university. In her case, she came up with several ideas after getting herself immersed in the cycling world and have collected as much information as she could around this topic. Her own experience of driving and cycling around London put the idea for *BikeLight* forward. She built a small prototype, without aiming to set up a company. Her colleagues and professor encourage her to apply for a design contest, which later on led her to enter and win an entrepreneurial contest. That is when she finally realized this idea might be more than just a product, and it could be a potential start-up.

> *"Once I did the deep dive (from Human Centred Design methodology) I realized that actually, such a small percentage of bikes are hit from behind…" "I wanted to find the biggest challenge for city cyclists and tackle it, so about six months of that year I spent working with a ton of other cyclists, working with the driving psychologists working with the bus company in the council and being out on the roads myself" (Founder 7, 2015).*

5.12.3.4 Take on an opportunity dismissed by a client / market opportunity

In the case of F4, she had been working as a freelancer before. She and her colleague researched a beauty company. They spotted one big opportunity in the grooming market for men,

which was growing rapidly. She recognized that one big area was bringing back the male grooming ritual of shaving. The Company did not buy the idea, so they decided to take over this opportunity and put forward the idea of designing for this niche. In this case, founder 4 worked as an industrial designer without expecting to become a Designer Entrepreneur in a consumer product start-up. During the interview, she mentioned that once the opportunity was in front of them, it was difficult to turn it down and ignore it. They took it as a long-term project, which perhaps could become a reality one day.

> *"After doing a research project for a client about men´s healthcare, I spotted that the user experience was poorly considered in the straight razors currently displayed on the market. There had been an increase for the demand to re-create the barbering ritual, grooming at home. Men take care of their appearance more. The straight razor has been always considered a professional's job kind of thing" (F4, 2018).*

> *"I worked as a freelancer for few years. Whilst I was in university I was freelancing. I wanted to start my own business, I had the flexibility, and I had regular clients, money coming regularly. I was ready to start my own thing" (F4, 2018).*

5.12.3.5 Hands-on exploration

In the case of Founder 5, his two designer co-founders designed a cardboard stool. After receiving a brief at university for their final assignment, they explored new ideas for furniture on Pinterest when they came up with cardboard furniture. One of the co-founders was working in a cardboard box' factory, so he knew how to work with it and had access to the material and tools. It was a convenient connection. They were curious about the material and decided to try its capabilities. This project was presented at the university as a part of the final project in a design subject. They immediately uploaded the photo on Facebook and less than five minutes later; they sold the stool. This post also helped them find founder 5, who immediately loved the idea and asked to be involved in this project. They achieved their first sale faster than anyone in the whole study, however, it needs to be said that the seed capital is almost zero since they had the scrap material and used their social network to promote the idea. They started in a very lean fashion, minimizing the risk of failure and relying on the word of mouth marketing.

"Cardboard is cheap, light and easy to use. We checked some tutorials online and decided to try out our own designs. We liked the final result of it. Our concept was developing temporary furniture to satisfy immediate needs" (Founder 5, 2019).

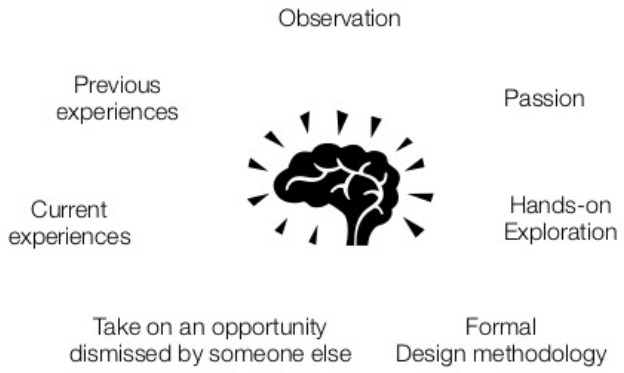


Figure 80. Different origins of the idea.

Figure 80 shows the different origins of the idea gathered from DE in this research.

5.12.4 Different Beginnings

5.12.4.1 University task: structured and semi-structured methods of design.

For the case of F2, F5 and F7, a brief handed out at university was the origin of the venture. They exemplify three different ways of approaching the design process. For F2, the idea came from personal associations and previous experiences as a nomadic student with family and friends far from her. For F5, as discussed previously, his co-founders came up with the idea after assessing what resources they had and finding inspiration from other online products available on Pinterest and finally for F7, the origin of the idea came after following a structured design thinking methodology, from the deep dive to the conceptualization and prototyping of it.

F2 did not use any methodological process to come up with the idea; she capitalized all her previous experience as a nomad student to find out the response in her own experiences. Her network included engineers experimenting with new open-source hardware. That motivated her to combine her ideas with what was possible to make. The brief given by the professor of F2 was: "In the future, more people will live alone. Design something for them".

The founders of *SitBox* have a common background in industrial design. The founders explored their skills and capabilities as well as the characteristics of the cardboard for the structural

process. They did not consider any user or potential client. They configured the product based on what they were able to do and their taste. For the case of *SitBox*, there was an open brief as long as they design and build a piece of furniture.

F7 got a brief at the beginning of her last year at university to design a product from start to finish, thus making her go through the entire design process. Once she deep dived into the problem, she found out what was the problem she wanted to tackle to announce the presence of the cyclist to turning cars. The brief given for the final project by the professor of F7 was:
"Design something that responds to the question: What are the challenges for urban cyclists?".

5.12.4.2 Recognition of an innovative idea

F1 and F5 did not come up with the idea. However, they spotted the potential of it from a very early stage. They both used their design acumen to detect a potentially successful product. Having worked in design for over 20 years, F1 could spot the opportunity for its novelty and cleverness. For F5, he could see the quirkiness of the idea, making him want to be part of it.

Founder 1 recognized the idea in a family Christmas dinner. He asked to be part of it; he was convinced that the idea had potential and his skillset and his previous expertise as an art director in a marketing agency could help the idea take off the ground.

> *"He mentioned it to me in a family Christmas party and showed me this prototype and I just thought "wow", you know, it's such a clever, clever idea [sic], clever invention. Then, I pretty much gave up work straight away and started to spend time developing the product and prototyping and working on the branding along with them […] as soon as I saw his invention, I just knew that it had certain qualities that you know, if it could be designed in such a way so they had a memorable name, as well as doing such a fantastic functional job, it could make a dream product" (Founder 1, 2017).*

F5 encounter the opportunity while navigating on his social network. A couple of friends posted something quirky, a stool made of cardboard. He imagined immediately how this idea could be sold as something unusual. Both of his cofounders were given a brief at university to design furniture. Having this task as a starting point, they were motivated by the immediate reaction of their prototype on social media.

"... they [the co-founders] posted a picture on their personal Facebook and mentioned that they were selling cardboard furniture. It was something I have never come across. I had them on my social network, I used to work with them. When I saw the post, I asked them "I want to be part of this, can I join?" they said yes, let's try! All of us are industrial designers" (F5, 2019).

5.12.4.3 Market opportunity vs personal meaning products

For the case of F6, personal frustrations triggered the need for a new device or to upgrade the existing ones. F6 struggled with the available stylus for electronic tablets. He bought around 10 styluses before thinking he could do a better stylus.

"The product came about after huge frustrations dealing with the experience other stylus deliver. I was wearing different hats at the moment, and working as a free-lancer for design led start-ups, and a little bit of lecturing at University. I had the idea right after buying my iPad 2" (F6, 2019).

For the case of F4, he spotted the opportunity after doing some research on the male grooming market for a client. The client did not like this idea and left this opportunity behind. She could see a chance to design a contemporary product to improve the rituals of grooming in men. This product has been sold for centuries. Therefore the market nor are the products new. Presumably, the market of straight razors has been decreasing since the invention of the disposable plastic razors. Thus, it could not be seen as a traditional market opportunity. What she could spot is the change of meaning that the man-oriented products are having and the potential to fill that gap.

"The original idea came from a client´s project, we did a deal with the client, they didn´t want to take it forward, they were happy for us to take it forwards in return for a small amount of work that we did for them for free" (F4, 2019).

"We started the product with a very simple idea, less is more. We wanted to update the design but also the experience. I believed there was an opportunity to bring back the ritual of grooming for men" (F4, 2019).

5.12.4.4 Spinning off from a consultancy to a product-based start-up

F4 and F6 had experience doing consultancy design work for local clients. They were both starting up their design studios when the opportunity of the tangible product came about. This decision was not accidental though. Both of them had the dormant desire to have a product made from start to finish and to set up a company with this product.

> *"The reason why I started doing it [PenTronic]was because it´s quite difficult to get work in Ireland for example, as a Designer […] So, it was about trying to create some value and help people to understand the value of design through creating a start-up as a result of design" (F6, 2019).*

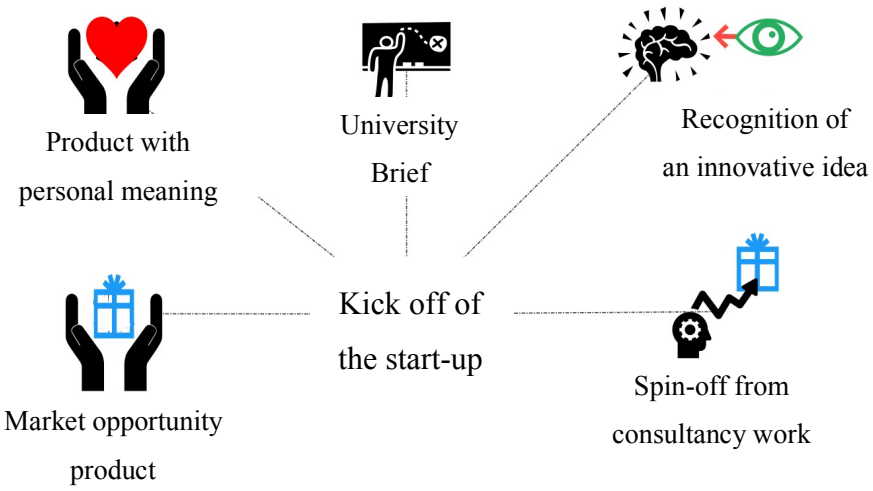


Figure 81. Similarities of how the entrepreneurs spot the opportunity.

During phase 2 data collection, Entrepreneurs identified a range of reasons they started their venture. Figure 81 presents a summary of those reasons.

5.12.5.1 Personal timing

Market timing is a factor that accounts the most for start-up success (Gross, 2015). In this study, entrepreneurs considered personal timing before taking on the challenge of starting up a company. Personal timing is crucial for entrepreneurs; it can hinder or facilitate the entrepreneur's journey. Personal motivation or familiar status are examples of it.

In the case of F1, personal timing was a big concern. He had a stable job. As a dad of three children, he could not decide on a whim. He had to provide for his family, so he had a lot to lose. At the same time, he was experiencing frustration and disappointment at work. As a lecturer at

college, he could not explore the ideas he wanted. He was overworked with administrative tasks that lingered with his desire to explore new ideas. So, he had to ponder the idea. He made his mind up. He was ready to develop the product, so he quit his job one week after agreeing to develop the product. This is the only entrepreneur in the study with dependents. The rest of the entrepreneurs did not have children or dependents, and were, on average ten years younger than F1, making the personal timing appropriate to take the risk.

For F2, F3, F5 and F7, they were finishing university, masters or bachelors' level, giving them the opportunity to start a career path as entrepreneurs.

5.12.5.2 Ecosystem timing

For F3, the ecosystem's timing was essential. She experienced lack of credibility among investors in the UK. She complained about the inadequacy of investors supporting young female entrepreneurs in product start-ups. It was not common in 2006 to invest in *IoT*, or in a company led by a woman. She also had to wait for technology to become cheaper and more accessible. The open hardware platform she used for the first devices was not in a firm position yet. Nevertheless, she decided to go forward once she had enough money to invest in the project and the technology advanced as well.

> *"…in retrospect I also think that there was a massive amount of sexism involved, because I was a 32-year-old woman, also investors don't really like investing in women to begin with and historically only 7% of all UK investments go to women so a woman doing something as odd as the Device Connected it was gonna [sic] be, you know, even less attractive" (F2, 2019).*

In the case of F6 the ecosystem played a decisive part of its early success. In 2011, the crowdfunding platforms were gaining popularity among the community of makers; the 3D printing technology was strengthening. Online platforms to contact far-flung manufacturers were ready.

> *"The PENTRONIC employed an interesting route to market. Rather than seeking funding through traditional channels, we decided to get the public to invest through a crowdfunding site" (F6, 2019).*

For F2 the ecosystem played a major role in the development of the company. At the early stage of her company, technology and market were at an early stage. She had to wait 7 years for

the technology to become cheaper, the market more receptive to her product and build up a community around the category of her product. Her personal network, part of the community she built, included inventors, software developers and successful entrepreneurs. Figure 82 show the two different start-up timing recorded in this study.

> *"…there was nothing else, and Kickstarter UK had just been launched so it was very early on in that whole ecosystem" (F2, 2019).*

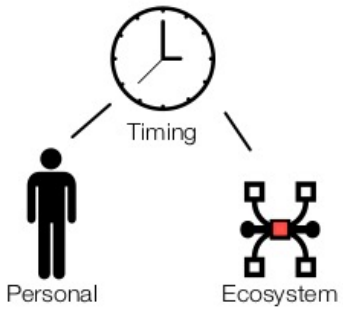


Figure 82. Two types of start-up timing.

5.12.6 The Start-up Process

In this research, the start-up process refers to the development of three different areas, the product, the company and the individual. In all cases, the evolution of the start-up, the development of the product and the experience of the entrepreneur happened in parallel.

5.12.6.1 Configuration of the product

Founders 2, 6 and 7 expressed how they would favour the functionality more than aesthetics. For founder 6, this statement summarizes his take on the matter:

"I am an avid believer in the James Dyson philosophy: design something that solves a problem".

His early prototypes tested the functional principles of the product, not the visual attributes. He iterated the product more than a hundred times to finally meet the requirements he was after.

For F7, it was clear that the problem was not ugly or expensive lights, the problem was cyclist being killed for being caught in the middle of the car's blind spot. She deep dived into the problem, caring about delivering a really valuable solution. She was dedicated how to prevent the most common accidents for cyclist. Her first prototypes tested the functionality and the mechanisms to attach it to the bicycle.

"Being seen as a cyclist you have such a small footprint, and that was the challenge. Drivers instinctively don't look for a bike, they look for a threat to themselves. They look for another vehicle" (F7).

For F4, a balance between aesthetics and function was very important. She wanted to bring about a product that has been there for centuries. Clearly, she needed to make a visual statement with the product but at the same time, it had to be clear that its functionality was up to date. She observed men shaving and using the available products when they came up with the potential opportunity for the usage improvement. After finding what they could improve in this product, they built several prototypes to test the ergonomics and visual attributes.

"Keep your product simple, keep your story clear, keep your product development costs down. The world doesn't need another 'Coolest Cooler' (F4, 2019).

For the case of F3 and F5, the aesthetics played a major role, since the objects they were creating were in a saturated market. They had to find a way to stand out and appeal potential users. Founder 3 had a very clear vision of what they were wanting to convey in the product. They were specifically competing in a market saturated by multiple competitors, so they have to stand out from the shelf. Founder 5 was concerned about the visual impact of the product. At the very beginning they selected the best material to improve the visual impact and a pleasant texture to the touch.

At the beginning we wanted to create a lifestyle, we all funders liked the style. We created videos, photos campaigns that talked about the lifestyle, not only the product" (F3, 2019).

5.12.7 Business early steps

Each one of the participants had different starts, differing from the traditional causal process mentioned in Chapter 1.8, which usually follows the sequence of market definition to segmentation to targeting objectives (return-of-investment) to positioning and finally reaching the customer. Interestingly, they did not match with the effectual logic either, which usually follows the sequence of defining the customer to defining the stakeholder (through who am I? What do I

know? Whom do I know?), to adding segments/partners to defining one of several markets (refer to Chapter 1.12, figure 4).

In the case of *BabySleep* (F1), they configured the product primarily based on a personal need. Sleep deprivation was something that all three founders had experienced and potentially any parent as well. They designed it based on their own experiences as dads. Founder 1 came up with a catchy branding in the family gathering, where the product was introduced to him. The product was not sorted yet, but it was important for them to have a brand and a name to start seeing progress and lifting the commitment of the cofounders. They waited to do the early market explorations with potential users until finishing the proof of the concept. It illustrates how, at this point, they had the configuration mindset as a priority during the proof of concept stage.

To carry on with the marketing research, they decided to hire some legal advice to support them with intellectual property. This would protect the product in case there had been a leakage of information from their participants.

> *"Up to a point we did everything ourselves, everything from prototyping to design, sales, looking for distributors, design for trade shows, that sort of thing, pretty much everything, we obviously out sourced for legal advice on IP for the basic patent application which protected the technical aspects and the product as well" (F1, 2017).*

In the case of *Device Connected* (F2), the brief received at university was fairly open. F2 built a prototype based on her experiences, considering no market research. She did an introspection of her own life and how disconnected she felt at times with her family and friends. She created a scenario where she was connected with her family, no matter the distance. She considered a wide scenario, and she put herself as the central beneficiary of the invention. She did not see herself as an entrepreneur but imagined how this could potentially benefit more people going through a similar situation as her.

> *"as predicted at the time, people would live on their own more and more and so it was kind of a mechanism for dealing with nomadic living and also when you have family all over the world. I think it was triggered by my own experience which was living in Italy with my father who was quite ill at the time and my mother who was still in Canada so my mother would try calling me the weirdest*

hours ever, because she didn't just couldn't get her head around when might be the right time to call. we ended up actually talking a lot less than I would have liked, especially considering my father died some years later so that was definitely the kind of set of conditions that led me to come up with the idea" (F2, 2017).

Consequently, she tried to license the product unsuccessfully as nothing she had created could be patented. She did not know any potential company interested in her product either. As a result of being early in the *IoT* scene, she could build up her network around engineers, designers, software developers as well as publishers and art curators. Despite not having a company yet, she built personal branding because people recognized her and the prototype and talked about them. She had a lot of free press and recognition from the design and maker community, which encourage her to leap herself.

For F3, the decision of starting up a company was there from the outset. He did not do any formal assessment of the size of the market but trusted that there would be more people like himself who loved trainers. He followed his passion for design and trainers and built something out of these two affections. The first collection did not have any external input; however as the start-up evolved, the more feedback on the designs was required.

His first action was to evaluate what resources were at hand and try to get inside the footwear ecosystem. In less than 48 hrs of making up his mind to start up a business in the footwear industry and without any definitive design or prototype, he had chosen the manufacturing company for his product, something that for the rest of the entrepreneurs happens long afterwards in the start-up process.

"I started with a very practical approach, I decided to go for the footwear after checking what we had at hand. It was easier to start a footwear company to a car manufacturing company. The first thing I did was telling a friend of mine from my course to go to Leon - a renowned city in Mexico, famous for its footwear industry-. We had the idea of creating a brand that could resemble the urban lifestyle from the south west USA, it was the vision we all fall in. We took the bus and arrive to the central station, without any reference whatsoever. Once there, we started asking people where are the shoes made." The first reference

was a shoe market where you could see the basic supplies for the shoe making like leather, soles, etc." (F3, 2019).

For F4, while doing research for one of her clients, she recognized a change of male grooming habits. She decided this was a project that could teach her in detail the process of setting up a consumer product business. She started the company having a clear client and a new interpretation of a traditional market. She wanted to learn from it and to use it as a platform to learn about crowdfunding, far-flung manufacturing and logistics.

"I launched this product as a learning opportunity. We wanted to launch our own. We did understand the development process, the manufacturing process. We wanted to feel the anxiety and excitement of launching a product" (F4, 2019).

For F5, the first sale happened just right after posting something on social media, unintentionally. That was the first action towards setting up a business out of this product. They designed the product with the intention of showing off their skills but no market or client in mind. They made their first sale before knowing the name or the branding. Validation came from the social media where they could grasp the acceptance and demand of their product, and the specific website came after seeing people demanding their products.

"It took 5 mins to sell the first piece on Facebook. People had not seen these types of products before. I think they were unique and very affordable" F5.

F6 did secondary market research. While working on his tablet in a project for a company, he tried more than ten styluses. Without treating it as a formal market research process, he was collecting information about the price, functionalities, point of purchase, main competitors and opportunity areas. He thought there were a few things that could improve the product functionality.

"Most of the products out there are throw-away sort of products, they were easily lost or misplaced and also tended to wear down easily" (F6, 2019).

He pondered the idea of launching this product once the prototype finally worked. He had a side project with his friends, a design collective. He was involved within a network of designers, creatives and students who were using their tablets for creative purposes. He was building an

unexpected community of potential early adopters. He put together a video for a crowdfunding platform and raised the money. Speed was the key. That was the beginning of the company.

> *"We went to a Crowdfunding platform because speed was the essence. This industry moves so fast that if you don't get in there someone else will" (Founder 6, 2019).*

Founder 7 build her prototype for her university project and worked on a business plan to participate in a widely recognized innovation contest. She won the UK competition and as a part of the price she attended a business incubator in the US. This was the beginning of her company. They guided her in finance, marketing and the business model of the company.

> *"…the program was sponsored by a -Large Bank - and had mainly Latin American countries, so Guys from Brazil and all over the world. I was the only Brit and probably the only native English speaker… to them entrepreneurship meant getting on with it… I was brand new to scene, I knew nothing about entrepreneurship, knew nothing about starting a company, to me was a no brainer. I'd learn to build a network, I could start a company" (Founder 7, 2017).*

5.13 Discussion

This section of Chapter 5 discusses the concepts, relationships and interpretations of the issues found in the previous section. They are considered in relation to earlier studies from both design and business disciplines. The discussion concentrates on the concepts that the researcher considered necessary.

In particular, this section of the chapter discusses the evolving mindset of Designer Entrepreneurs as they progress in the business. This is built on their sense of authorship, reputation-making through stories and how they build trust and authority as a new organisation in their field.

The following categories have been selected by the researcher due to their greater impact on the research and design field. Theories from previous studies helped to enrich the discussion.

5.14 Discussion about the findings

5.14.1 Discussion on the DECPI typology

The a priori analysis pointed out what elements of the preliminary DECPI typology were redundant and which others have relevance for Designer Entrepreneurs. In fig. 87 the relevant elements of the new typology are presented. Some elements were subtracted from the preliminary typology due to the lack of evidence in the study to support their usefulness. Design thinking, strategic design and industrial design have a close synergy, the same as effectuation, bricolage and causation.

5.14.2 Principal considerations in the new typology

Design thinking has become an innovative cross-disciplinary approach, able to connect multiple perspectives under its method. Recent studies consider other approaches that complement the Design Thinking method, shown in figure 83, expanding the definition that this research took at the beginning of the study. Perego et al. (2018) describe four types of design thinking:

- Creative problem solving: Designers assume that the user has a need or a problem, and they set off in the search for a solution (Dell´Era, 2018). The necessary steps consider discovering, defining, developing and delivering solutions. The double diamond methodology from the Design Council and Design Thinking from IDEO are good examples of this category.
- The innovation of meanings: This is the newest paradigm of design thinking. This approach starts by envisioning a scenario to support the search for a new meaning that can create a meaningful gift for the user. It redefines the direction of the company and the problems worth addressing (Dell´Era, 2019). The primary steps are envisioning, criticize, probe and talk.
- The sprint execution: is a technology-driven approach aiming at developing a product having in mind the user research (Perego et al., 2018b). Its main steps are mapping, building, measuring and learning.
- The creative confidence: it refers to the type of design thinking that makes people more confident with creative processes and align the organizational culture and practices to implement innovation trajectories (Perego et al., 2018b). Its core steps are: engage, co-design, involve and co-develop.

The processes that participants of this study followed can be classified between the creative problem solving and the innovation of meanings approach. None of them developed either a design

sprint or the creative confidence model. The preliminary DECPI typology did not consider the envisioning step, where the designer proposes a meaningful gift to the user. Contrary to the traditional design thinking, this is an inside-out approach. Most of the designers in the study did not consider the user needs to come up with a product. Therefore, the new DECPI typology excludes this element. Figure 84 Shows the Final DECPI typology.

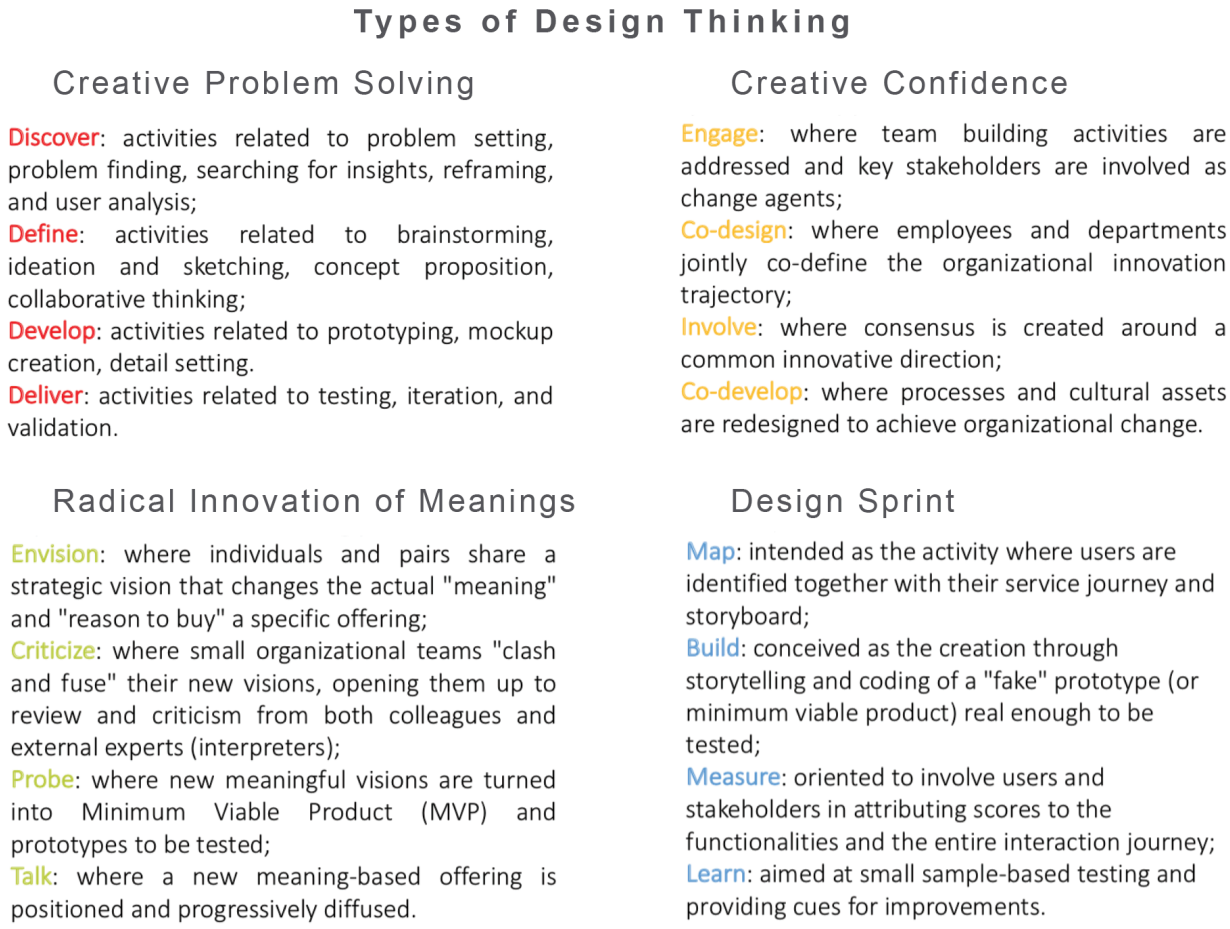


Figure 83. Types of design thinking (Perego 2018; Dell'Era, 2019).

Figure 84. The final version of the DECPI typology. The relevant elements are presented.

5.15 Discussion on the mindset of Designer Entrepreneurs

According to Owen (2006), creative individuals tend to work in two different ways. The Figure 85 shows on the left -hand side the "finder" profile, referring to individuals whom their creative output is achieved through the discovery on new theories and providing compelling explanations of a given phenomenon. We can portray this profile as scientists or academics in natural sciences. On the right-hand side of the figure is described as the "maker" profile, which concentrates on individuals producing inventions, shaping their environment with constructions, products and concepts.

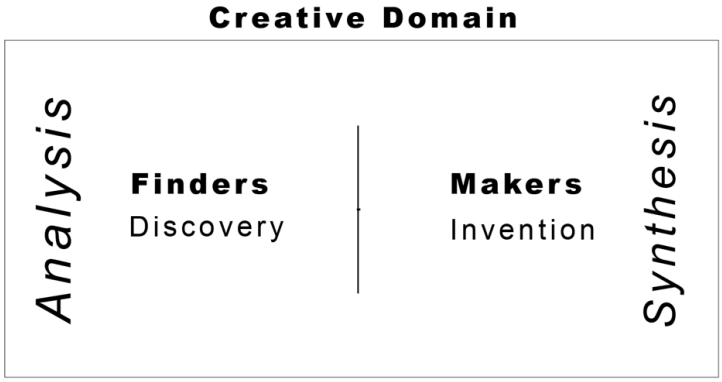


Figure 85. Partial map of fields created by Owen (2006).

We can separate these two profiles with a horizontal analytic/synthetic axis. The symbolic side relates to the representation and constructions of abstract ideas, while the analytic side refers to the use of logical reasoning. Figure 86 shows a division between individuals concentrated on finding or inventing; at the same time, a vertical-horizontal axis divides the symbolic and real outputs. Fields in the upper half of the map are more concerned with the abstract, symbolic world and communication. Fields in the lower half are concerned with the real world and the artefacts and systems necessary for managing the physical environment (Owen, 2006).

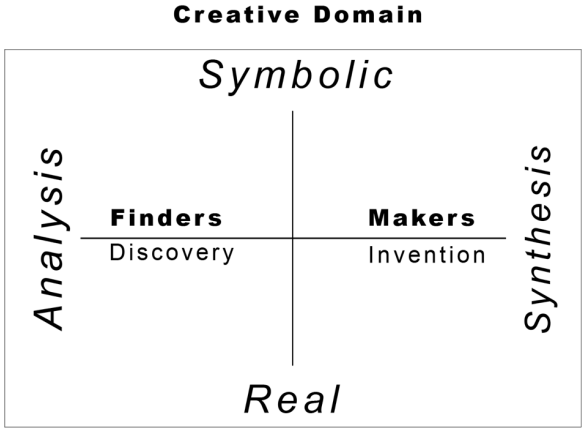


Figure 86. Map of fields created by Owen (2006).

To clarify this matrix, Owen showed this map alongside four different disciplines, Design, Medicine, Science and Art. Industrial designers tend to work more at the bottom right quadrant (but not exclusively), called the synthetic-real one. At the same time, the artist manages to work more, but not solely, in the upper right quadrant, in the symbolic-synthetic one. Similar case

happens for hard science which tends to work more, but not only in the top left quadrant and finally Medicine that is more involved in solving analytic-real issues.

Business people work mostly under the analytical-real quadrant. In contrast, Industrial designers have been trained to work mainly in the synthetic- real quadrant, making them more capable of materializing their ideas, notwithstanding, they draw upon other quadrants to conceptualize their designs.

This study provided the evidence of how the natural inclination of designers at the beginning of their ventures is to remain in the inventive, creative domain, called on figure 91 as the maker creative domain (right-hand side). Designers are good at conceptualizing and abstracting ideas, using an abductive-inductive approach to figure out solutions to given problems or even so, reframe problems to widen the solution spectrum. That being said, the case of Designer Entrepreneurs demands the determination to cross from the synthetic to the analytical side of the diagram (figure 88). In the very early stages, the effectual logic and bricolage proved to be effective to gain traction and put together the team and the value offered to the user, however, when activities like sales, cost structure, revenue models and a detailed business metrics came across, designers had to leap an uncomfortable domain, breaking down the hands-on attitude of the product entrepreneurs. In some cases, these activities were seen as indispensable while in other cases; they were put off until they became urgent/critical.

Confronting Designer Entrepreneurs with new paradigms of thinking such as business and new venture creation could create mental and physical discomfort. Psychologists have studied how individuals deal with the discomfort of having two or more elements of knowledge which are inconsistent with each other. Festinger (1957) named the phenomenon of Cognitive Dissonance (CD). CD is described as the lack of consistency among beliefs, feelings, behaviours, attitudes and perceptions and the mental and physical discomfort they produce. The theory suggests that individuals try to remove the inconsistency by changing behaviours, changing the dissonant cognitions, adding new consonant cognitions, or by trivializing the cognition.

Designers tend to work in a constructive-pragmatic way opposite to the analytic-systematic way of business people. At the very early stage of the product/start-up, where the solution was still being ill-configured and the business was yet to be defined, the participants materialized their ideas without thinking on a particular market, business model or even brand identity. Cases like F5 made

their first sale even before having the intention of setting up a company; the intention was to seek validation of the product, yet it turned out to be their first sale.

5.15.1 The mindset-dependant evolution of a start-up

For Salamadez et al., (2015), two paradigms describe the start-up development. The first and most common one is called Life Cycle Theory (LCT); The LCT perspective states that the development of the company is progressive and evolves linearly. It holds that organisations can achieve a state of balance in their operations because organisations are stable systems. This theory considers the environment and the organisation´s problems as predictable (Salamadez et al., 2015). The other paradigm is called Complexity Theory (CT). In this paradigm, the organisation is always imbalanced and depends on the viewpoint of the entrepreneur. This wobbly environment is due to the fact that the variables surrounding the start-up such as market, technology, normative and society are continually changing (Salamadez et al., 2015). This study showed that the start-up, the product and the Designer Entrepreneur transformed since day one. However, the key elements guiding the pace of change was the Designer Entrepreneur steering the venture to adapt to internal and external changes. The evolution of the company as the entrepreneur´s mindset-dependant, making it the essential variable in the emerged theory. The entrepreneurial journey strives for the creation of new order, for sense-making the existence of the product and the start-up influence by the ecosystem, the technologies and the market (Mckelvey, 2002).

5.15.2 The four mindsets

The analysis of the data in this study has suggested four different mindsets that Designer Entrepreneurs tend to experience during their start-up journey: the artisan, the configurator, the opportunity taker and the design-leader. These different mindsets are experience-dependent and can be changed during time and specific milestones. Individual decisions, attitudes and circumstances triggered the change in the mindset of the designer, affecting the allocation of time and resources into particular activities that reflect the new priorities of the Designer Entrepreneur, product and start-up.

The mindsets are a conceptual representation of the progression experienced by DEs throughout the entrepreneurial journey. This progression in the mentality of Designer Entrepreneurs was divided into four primary mindsets to make the analysis and description easier. Each mindset is not mutually exclusive. Conversely, they are symbiotic. The only difference is

their weighing. The mindsets change places of importance as the start-ups unfold. Figure 87 portraits the sequence of the mindsets described in this study.

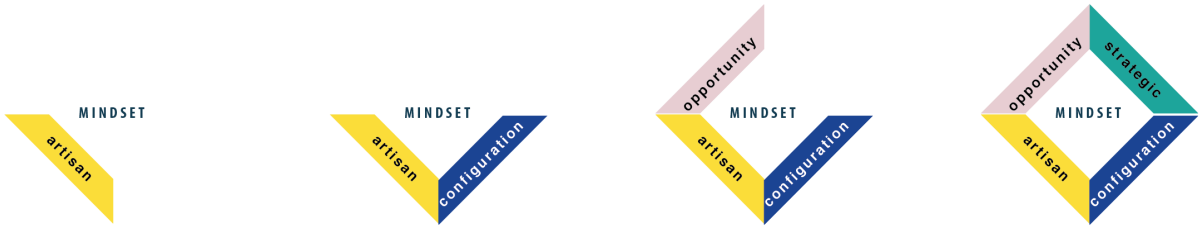


Figure 87. Sequence of the mindsets described in the study.

A business can be run under any predominant mindset; however, the case of this study reflects the advantage of evolving the designer's mentality into a more flexible one, adequate to transit from the design and business discipline in a strategic way.

5.15.2.1 Artisan mindset

Designers under the artisan mindset spent time and energy into tinkering with new technologies or fiddling with materials or sketching multiple concepts of the same idea before even thinking of building up a product. They found meaning, purpose and gratification by mastering new techniques, polishing their taste, trying out new ideas and exploring the boundaries of their skills and the characteristics of their early objects.

The artisan mindset refers to the stage where the designer prioritizes the creative exploration of materials, technologies, forms, shapes, textures and aesthetic properties.

A few sells were detected at this stage; however, this study includes this mindset due to its latter importance in the venture creation and the identification of the product opportunity. F2, F3 and F5 are cases where this exploration of new technologies, concepts and materials added to their acumen to later on being able to draw upon this knowledge and use it to build the business/product idea. At this stage, the inventiveness of the designer comes afloat, giving attention to identifying, inventing and exploring new opportunities or market niches (Wilson & Stokes, 2005).

5.15.2.2 Configurator mindset

Self-expression is not the primary goal; the priority is to design a product, solve a problem and identify the value proposition of the product. Greiner (1998) described how, as a business grows, the demands placed on it will change. At the beginning of an enterprise, energy, ideas, and

passion are enough. However, evolving businesses require the development of procedures, process and systems (DK, 2014).

DK (2014) establishes that it is not common to see entrepreneurs willing to employ people who are neither family nor previously known friends. The lack of time and resources makes them be "jack of all trades" hindering the speed in which they could be testing the market and exploring how to grow in the medium horizon.

The participants in this study agreed that their initial efforts were not concentrated on formalising or systematising their ventures. Conversely, they focused on the configuration of the product and understanding the problem they were addressing. Once they have identified the product opportunity, they conceptualise their product having themselves in mind as a potential user of the product to solve a problem they had or were experiencing. The case of F4 is out of this generalisation since she could not test a shaving device for herself, having to rely on external feedback.

Their reluctance to perform actions in the business realm that contradict their natural procedures (cognitive dissonance), kept the entrepreneurs away from drawing on opportunities that make their business grow. Acquiring new knowledge in the realm of business and management is not a priority in this stage since the trial and error and explorative approach help to settle the main features of the product.

At the very early stage, creating this mental discomfort put off the entrepreneurs, yet, most of them could go out of this stage once they realised the importance of moving forward their venture.

The trigger that takes designers with the artisan mindset to the configurator mindset is the brief and the specific user for the product. According to Cardon et al., (2009), when an individual experience an intense passion about a particular activity, topic or experience they can feel an obsessive response to the object, experience or activity. This means that the way the individuals respond to contradictory stimuli (negative feedback or suggestions) is rather inflexible and rigid, hindering the adaptability of the start-up/product.

5.15.2.3 Opportunity seeker mindset

Participants F1, F3 and F5 can portray the opportunity-seeker mindset. The development of the product and the development of the start-up happened almost in parallel. The opportunity

mindset seeks out to attract resources to the venture in the form of financial, knowledge, network, suppliers, retailers, grants, contest and diffusion.

To achieve this, founders must delegate, communicate and coordinate activities or employ people with these skills to do so. Some leaders can change the identity along with the evolution of the company, some others struggle to make the necessary changes, and hence they try and fail or decide to remain at the same place.

The lack of knowledge in business that hindered the evolution of the start-up in the previous mindset is replaced by the increase of involvement in the business realm. Delegating the task makes the entrepreneur lose control over the product and the start-up, nonetheless, the time and the focus gained contributes to boost the performance of the venture, allowing the entrepreneur to spend more time to seek out opportunities that make the business grow. The activation of this mindset does not mean the other mindsets shut down; it means that they go to a second-tier, not being the priority of the entrepreneur at that specific moment.

The opportunity-seeking mindset taps into every opportunity to increase the sales, better the margins, automate the process, reduce the waste, get access to money, launch a crowdfunding campaign to gain traction and validate the market. One of the main objectives of this stage is the constant lookout for mechanisms that support their growth, such as accelerators and incubators. The next stage, the design-leader mindset is achieved when the entrepreneur expands the business to other countries, design the product or iterate the existing one based on key performance indicators and business strategies. Their decisions are driven by business analytics, stretching his design leadership into other areas of the company.

As a leftover of the previous mindset, the creative side of the entrepreneur keeps emerging in different areas of the company. An example would be the way Designer Entrepreneurs pitch their ideas to either investors or crowdfunding platforms. Elsabach (2003) studied venture capital pitches finding that investors responded positively when the entrepreneur came across as a creative individual. The inability to communicate in business jargon makes Designer Entrepreneurs ineffective to raise capital from traditional investors, yet, they compensate this with their user-centricity and their visual way to persuade people.

This makes Designer Entrepreneurs effective in raising money from crowdfunding platforms, where individual investors also lack specialized knowledge in finance.

5.15.2.4 Design leader mindset

The design leader mindset can be portrayed with the latest stages of participants F1 and F7. The design leader mindset has a vision where his/her product or company needs to be in the near future. The transformation of the designer into a business person reaches a new level when designers know how the business indicators influence product decisions. They fully delegate the operations of the start-up to concentrate on the direction of it. The expansion to other markets opens other opportunities for more products in the same sector. The Designer Entrepreneurs can navigate from the business side to the design side of the company having an integral perspective of the company. This is the last mindset before the start-up transforms into a company. The strategies can be articulated, and the task can be delegated according to the expertise of each person. Design is seen as a strategic differentiator in the industry. The niche market can potentially turn a trend.

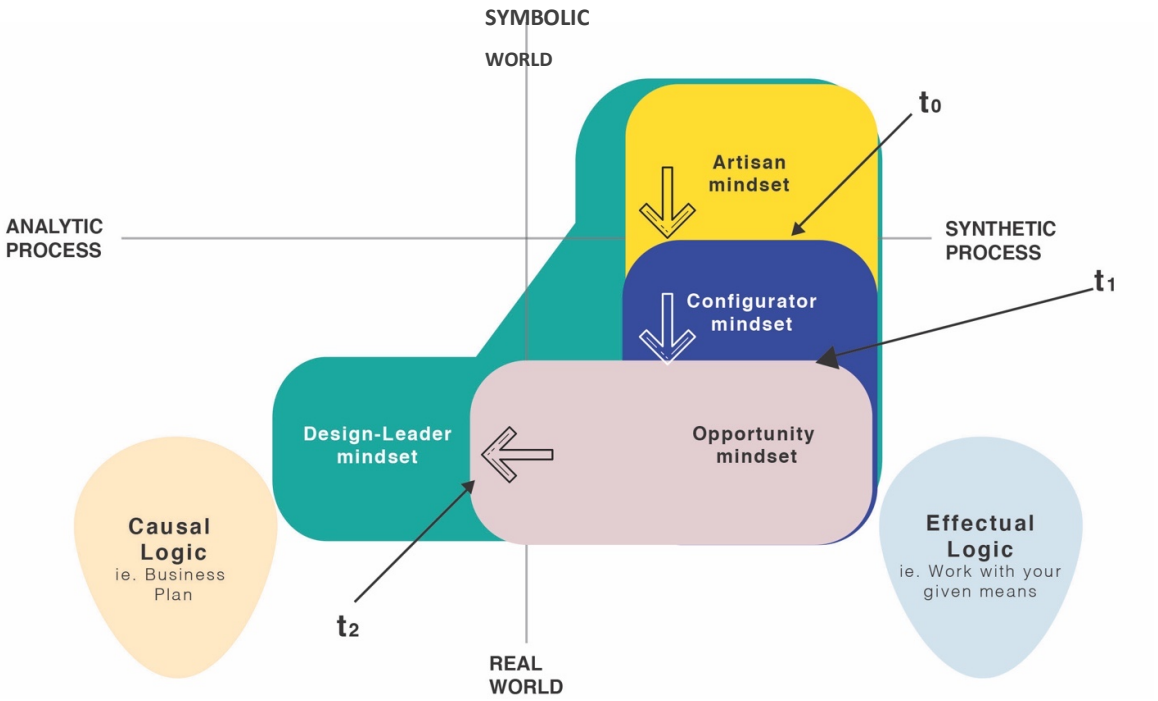


Figure 88. Evolution of Designer Entrepreneur´s mindset as a mechanism to mediate the cognitive dissonance between the design and business realm. Please refer to the video on the footnote[5].

[5] Video of the mindsets:

Figure 88 portrays how DE´s go from the artisan mindset up to the Design leader mindset, stacking up each mindset on top of the previous one, without losing the opportunity to get back to that stage and use it in their own advantage. It is evident how DE´s go from an effectual to a casual logic as the business demands more complicated decisions and the risk gets higher.

5.15.3 Transitions

The evolution of the Designer Entrepreneur´s mindsets is illustrated in figure 88. There is a transition between each stage that represents a shift of paradigm that made the designer take one step further out of the traditional design realm towards the business realm. Figure 89 presents the evolution of the mindsets and the transitions in between.

5.15.3.1 Transition t0

Transition 1 represents the change from an explorative mentality to a product oriented one. In t0 the orientation of activities changes from execution, technique, taste and mastery oriented to a more personal meaningful one. The Designer Entrepreneur is led by the activities which he feels passionate about, exploring personal beliefs, needs and values through the object. A phrase that synthetize this transition is “We might be onto something” (F1, 2018).

5.15.3.2 Transition t1

T1represents the addition of the more sophisticated industrial design tools. Viability, desirability and feasibility weigh more into the decisions of the organization. The survival of the company pushes designers to stretch out their skillset into manufacturing, business management, logistics and finance, in order to secure the growth of the venture. Examples from this transition point are:

“We either need to stop doing it or we just put it out there and launch it” (F4, 2019).

“Just ship the damn thing! Sort of attitude” (F2, 2019).

“We need a business plan to ask for a loan” (F5, 2019).

5.15.3.3 Transition t2

T2 represents a shift of priorities, the organization comes first, and the industrial design subduing to the business priorities. The creative output of a designer does not stop; it just changes their focus. Now the expansion of the company requires adaptation and fast response to new challenges.

“I am not only a designer, now I am a business person” (F1, 2019).

"it took us quite a long time to realize that the business (metrics) should also be informing the design process" (F5, 2019).

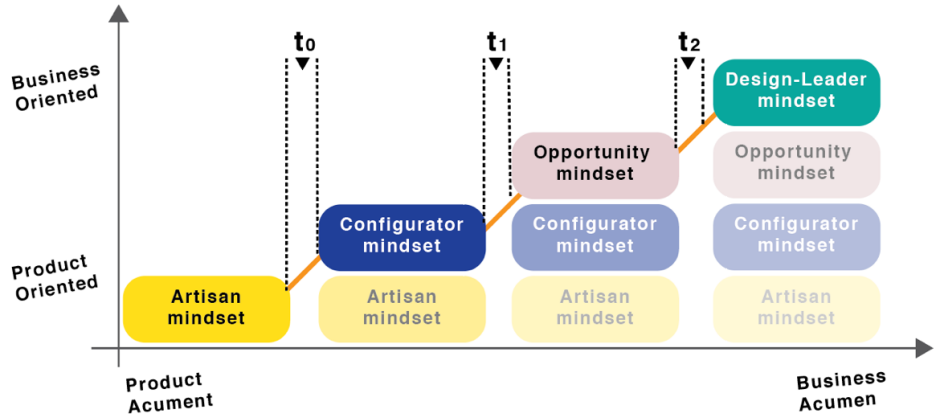


Figure 89. Evolution of the mindsets and the transitions in between. Please refer to the video on the footnote[6]

5.16 Tracking the mindsets and the entrepreneurial progression

As anticipated by the literature review, there is a clear indication of how the designer's logic and design as a discipline changed across the journey. However, the literature review did not anticipate that every event, challenge, failure and any additional tool and skills learnt by designers also shapes the way they think. This mentality is influenced by the events faced during the entrepreneurial journey. The themes emerged during the Phase Two data analysis described this change of mentality as four different types of mindsets. On top of each timeline of milestones, there are small colour rectangles that correspond to the DECPI typology and the additional Mindset tier, as shown in figure 90.

[6] Video of the mindset´s triggers:

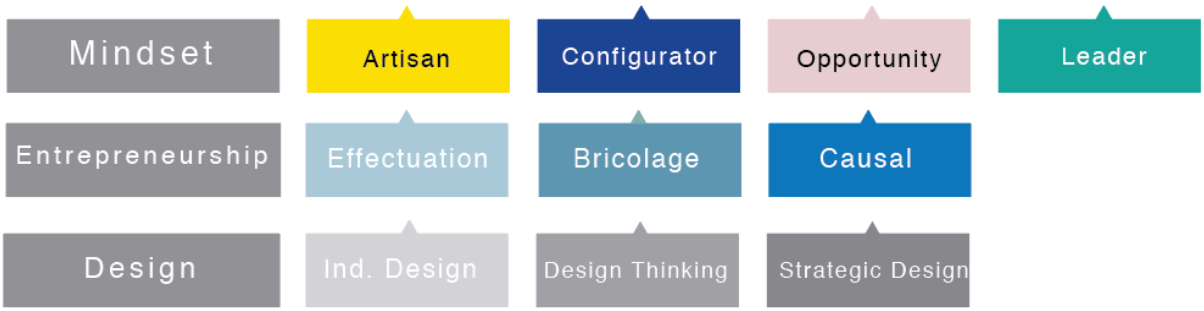


Figure 90. The three levels of transitions: Mindset, Entrepreneurial logic.

There are three levels of entrepreneurial progressions,

a) Designer transition: from artisan mindset to design leader mindset.
b) Start-up evolution: from effectual logic and bricolage to a casual logic.
c) Product development: from design for product development to design as strategy.

In figures 91 and 92, the selected examples of the entrepreneurial journey of the companies PenTronic and Trainers show the addition of the three levels of entrepreneurial progressions. In figure 93, the same companies´ journeys are shown, however to allow the reader to concentrate on the three-tier entrepreneurial progression, the milestones of each example have been removed.

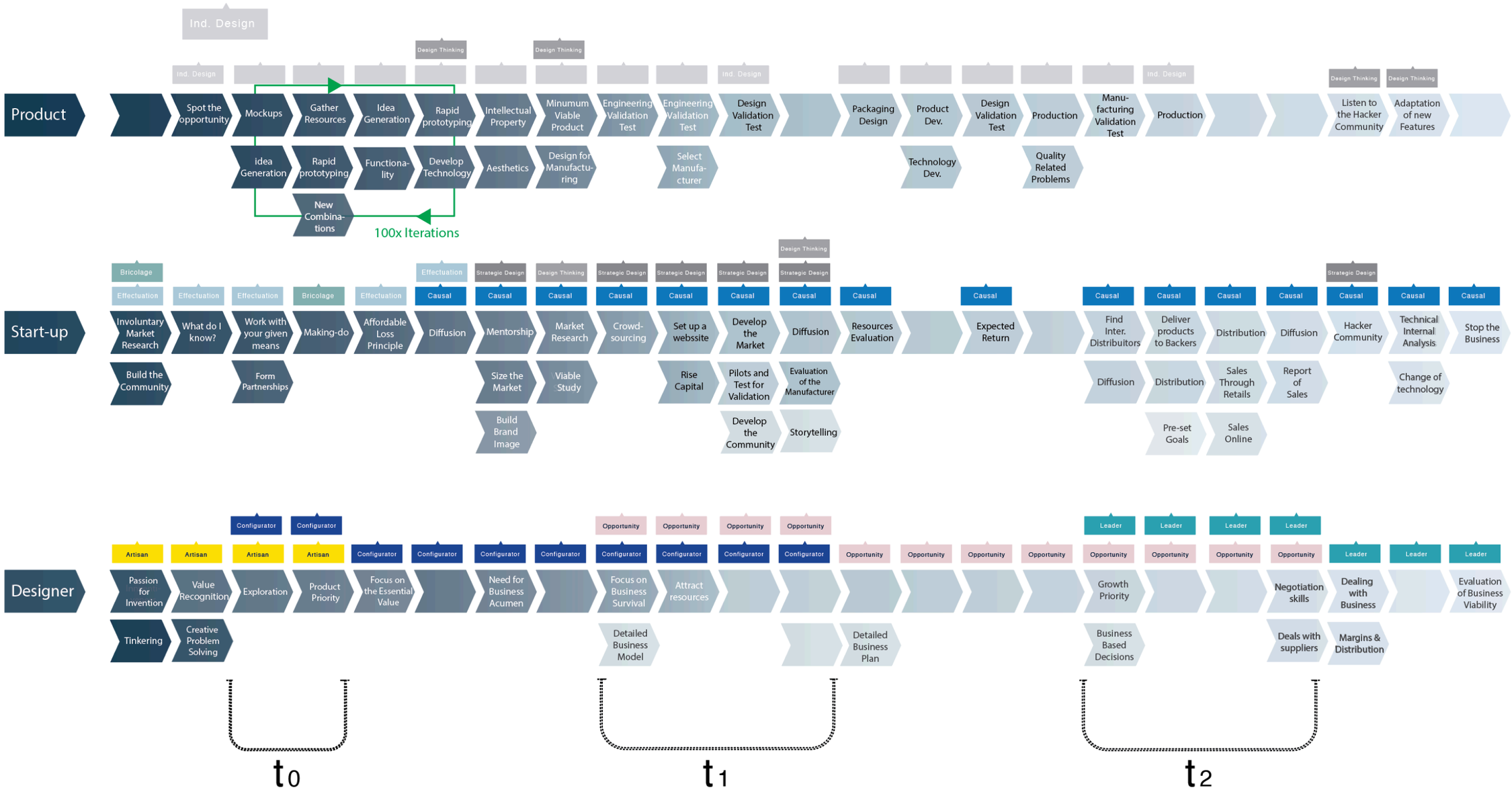


Figure 91.Example of the integration of the DECPI framework and the Designer Entrepreneurial Mindsets in the timeline of the start-up PenTronic – F6.

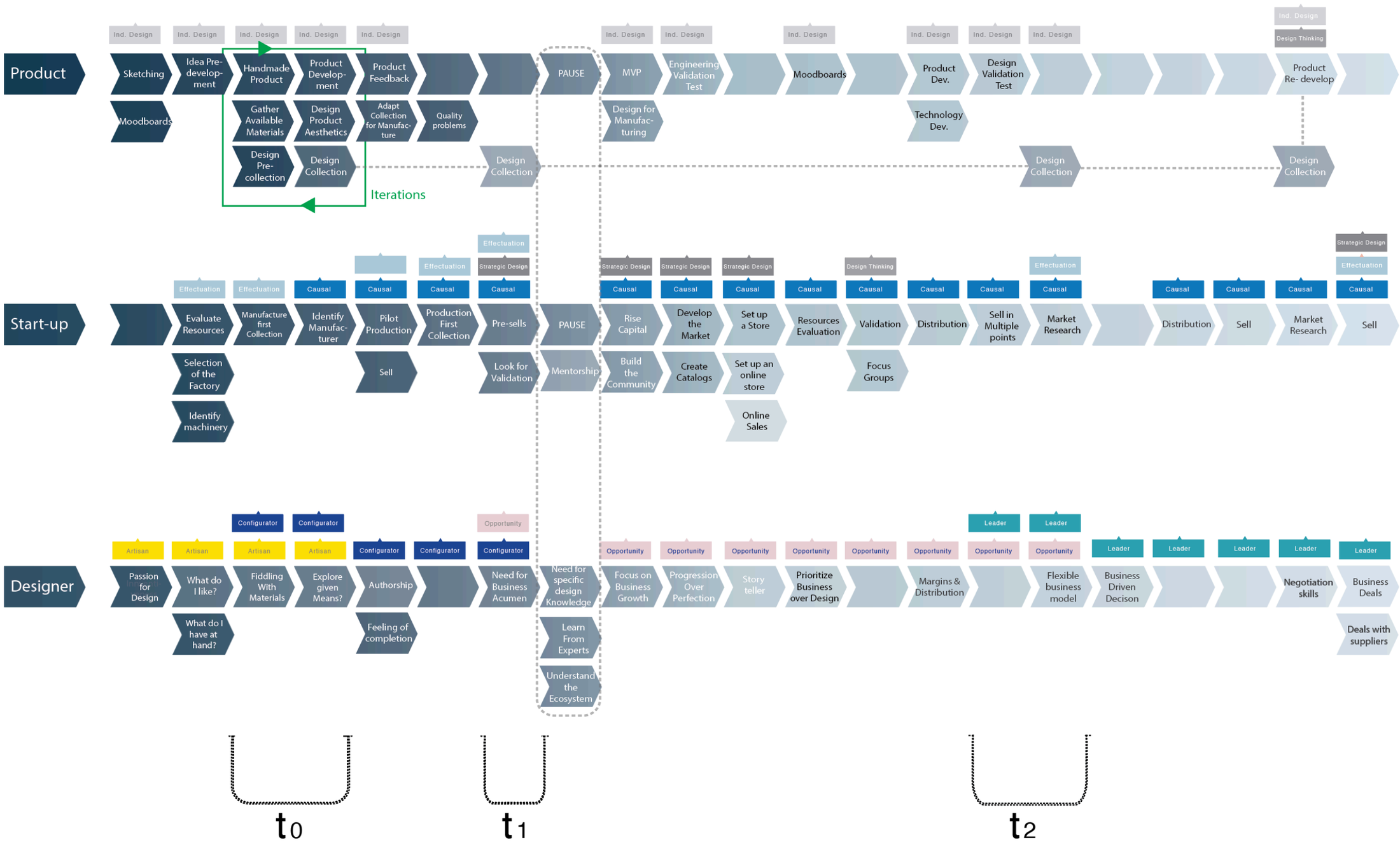


Figure 92. Example of the integration of the DECPI framework and the Designer Entrepreneurial Mindsets in the timeline of the start-up Trainers – F3.

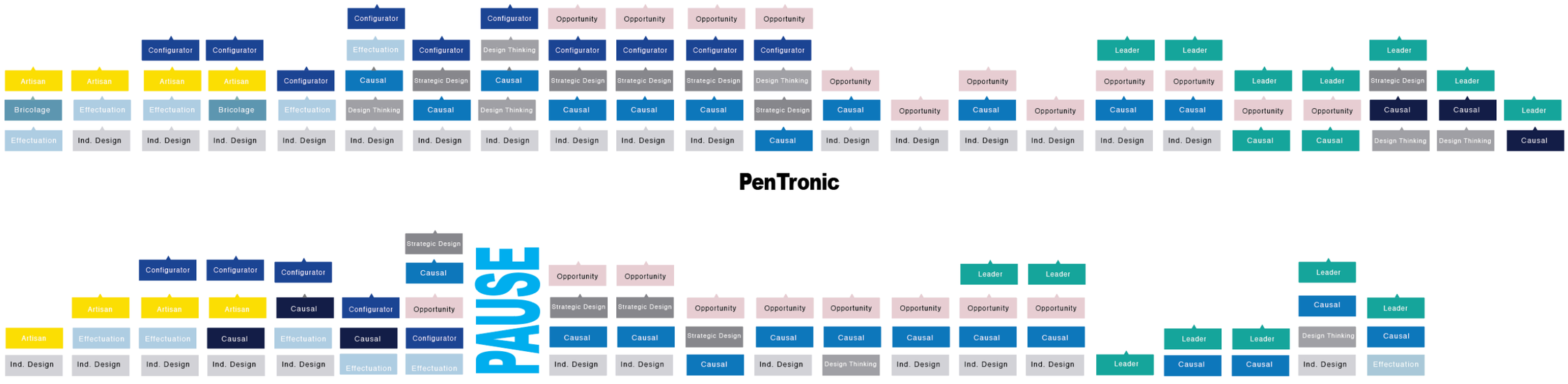


Figure 93. Comparison of the two examples: PenTronic (upper image) and Trainers (bottom image). The entrepreneurial progression experienced by Designer Entrepreneurs during their entrepreneurial journey.

5.17 The sense of Authorship: the Geppetto effect.

In this study, the strong feeling of reward and accomplishment experienced by the individuals once their creative output is being assessed, valued and recognized as his/her, by their peers or public is called authorship. The sense of authorship is a recognition of the distinctiveness of their own work compared to what is known, established or has gone before. It could be equated with a sense of leadership and motivates them to conclude the product regardless of the consequences. In some cases, a lack of business experience or a lack of technical understanding did not deter the DEs from driving onwards to conclude the industrial design elements.

Craftsman, artist and designers express their thoughts by creating. This creation comes along with a creator´s signature that represents a potential legacy, tradition or reputation. A distinction between craft and art is not clear, and that discussion has not been settled yet. A practical approach is to differentiate craft when it serves a practical necessity, such as "I need to cover my feet from the cold". On the other hand, art serves as the emotional and intellectual necessities of the creator that may or may not convey meaning to the audience. These necessities are loaded with beliefs from the individual. It is an inside out process without briefing. Product design is focused on the configuration of an object. It starts with a brief, striving for a viable, desirable and feasible product.

Design education in the UK is anchored in Art education, and the link between them is the commonality of the artistic practice. Therefore, this study infers that designers are educated to share those characteristics. The art of practice is divided into conceptual practice and material practice. The conceptual practice refers to the ideas, philosophies purposes and reasons that the artist have before to the execution of the artwork. The material practices deal with the practical execution of the art such as materials, processes, procedures and techniques.

To understand this point, a diagram has been drawn integrating the findings of the study and utilizing a framework that categorizes the material practice as craft authorship: related to making; the conceptual practice related to the gestation of the idea as artistic authorship; and the design practice as configurative authorship. These three components are portrayed in figure 97.

In this study, the authorship that designers' entrepreneurs experienced was also subject to multiple changes. Some participants had an epiphany after being immersed in a challenging situation; some others came up with a product after spending time sketching, fiddling with the material or experimenting with new processes or technologies.

Designer Entrepreneurs learn how to shift their focus from the craft-artisan authorship to the artistic or the designer one. They blend this priority with the business requirements. Figure 94 shows the designer´s authorship model.

Figure 94. The three components of the Designer´s Authorship. The bottom side represents the craftsman priorities, the left-hand side represents the artist priorities, while the right-hand side represents the designer priorities.

Social recognition has a high weighting within the idea of authorship. This social recognition has also evolved throughout the years. Vasari (1550) published the book "Lives of the Most Eminent Painters, Sculptors and Architects". In his work, he described the talent of a contemporary artist. Before this, the name for the workshop "the house" was the one holding the credit and the reputation (Vasari, 1550). This reputation was earned by merit and mastery of the skills. What Vasari did was to share biographical details of the artist to improve their reputation, thus uplifting the individual value over the value of the workshop. He placed them as the masterminds behind the pieces. Nowadays, Designer Entrepreneurs have the chance to reach out to wider audiences. While they are raising money through crowdfunding campaigns, they need to share their "struggle"

to let people know more about them. They convey the authenticity of their creation and the coherence between the product, them as individuals and their business proposition or start-up. The participation in multiple competitions and awards helps them to establish their reputation, aiming to be seen and recognized as the master minds behind their creations. However, once the company is on track, they seem to change the personal authorship to the company's authorship. This idea is similar to what Kotey and Meredit mentions in their study (1977) about the transfer of personal values to the organizational values. They found a high correlation between personal values, business strategy and enterprise performance. The transmission of the founder´s authorship to the organisational authorship detaches the designer's embodiment of the brand, and move forwards building the company´s brand. Further, the evidence showed how the entrepreneur personality influenced in the business strategy and business performance.

5.18 Design entrepreneurial passion

Shalley et al, (2015) summarized the definition of passion coming from different studies into three main overlapping themes: passion is accompanied by intense positive feelings; it regulates individual behavioural tendencies and; it is target-specific construct.

Entrepreneurs have been identified as nonconformist, and focused individuals (Ernest & Young, 2011). According to DK (2014) Personal passion is essential in a successful start-up (DK, 2014). Cardon et al (2009) integrated a summary of different items that Designer Entrepreneurs can feel passionate about into four main areas, the task, the product, the opportunity and the constant seeking of an advantage. Vallerand et al (2003) suggest that passion can be also characterized with cognitive and behavioural components such as investing time and energy. Another trait that entrepreneurs can experience when feeling passionate is exposed by Brannback et al (2006), He noted that passion enhanced mental activity and provided meaning to everyday work.

There is evidence showing that passion can also have negative effect on entrepreneurs, by interfering with the development the company. Branzei & Zietsma (2003) proposed that passion can have dysfunctional effects on the entrepreneur and the start-up, such as obsession and discounting negative information. Some entrepreneurs struggled to assimilate the feedback received about their product, and some others recognized that "you only hear what confirms what you already know" (F1).

5.19 The mindset and the cognitive harmony

In the same line of the cognitive harmony explained in Chapter 7.2.3, this study shows how the behaviour and the identity follow a similar rationale.

When an activity validates the identity of the individual it arouses positive emotions, conversely, when the activity lack coherence with the identity of the individual, it is tagged with a negative emotion, causing the individual to disengage and store with avoidance links (Cardon, 2009).

In other words, when Designer Entrepreneurs have a salient artisan or configuration mindset, they find activities such as interacting with new material, tinkering with new technologies, crafting the product, exploring new ideas and inventing new ways of solving the problem associated with positive emotions. They can spend large amounts of time focused on how to improve the product and its characteristics. The positive emotions caused by these activities promotes states of flow in the designer. This state of flow is experienced by individuals who can invest big amounts of time and energy towards an emotional goal (Csikszentmihali, 1990; Valerand, 2003).

Similarly, the same happens when the Designer Entrepreneur finds pleasure in growing the company, under the Opportunity or Designer-Leader mindset. Findings from this study, particularly the cases of F1, F3 and F6, suggest that these positive emotions are also achieved by Designer Entrepreneurs, in response to them recognising the progress they are making in establishing and growing of the company.

CHAPTER 6 - THE THEORY

6.1 Introduction to the chapter

The Constructivist Grounded Theory approach of this study guided the designer throughout the research. This study concludes with a presentation of the new theory emerging from this investigation. The purpose of this theory is to explain the designer's transition in terms of the what, how and to some extent why designers may increasingly feel equipped to become entrepreneurs. The insight gained from participants in this study shaped the understanding of how this process works and how it is experienced by DE. The theoretical model proposed in this chapter explains the transition in the mindset that typify a designer´s experiences when they transition from being principally designers to being principally an entrepreneur to set up a company.

To better describe the research output, a theory needs to be developed. It is worth remembering that a theory can be provisional and is an elegant declaration that states what and how and preferably why something happens for Saldaña (2016). Tavory and Timmermants (2014) and Saldaña (2016) described the elements that any theory has:

- It accounts for variation in the empirical observations
- It explains how and/or why something happens by stating its cause(s) and outcome(s)

The result of this research is a theory that addresses what, how and why is the transition that designers experienced when starting up a product-based company.

6.2 The Designer Entrepreneur´s transition theory

Designer Entrepreneur's Transition theory covers three of the previous arguments presented in Chapter 5: the mindset plasticity, the Geppetto effect and the cognitive dissonance effect.

6.2.1 What

The transition experienced by designers during their entrepreneurial journey is defined by the mindset, the sense of authorship and their ability to toggle between different logic domains.

6.2.2 How

The creative problem solving that designers developed during their design education, drives them to articulate their businesses following a similar rationale. At the beginning, this rationale prioritises the effects of their actions rather than following a goal-oriented plan. However,

this rationale presents some limitations whenever the business grows, and it demands decisions that can compromise the mid and long-term future of the company.

For a designer, the starting point does not require a systematic method or any single established set of tools either from the design domain or from the business domain. Instead, a sense of purpose dominates. Designers are prone to dig deep in their emotions and desires before starting up a product-company. This "dig deep" stage does not happen in a forward-planning way, instead, it happens through exploring new forms and shapes, new ways of making, crafting, interacting with new technologies and fiddling with new materials. It is experimental.

The lack of external participation at the very early stage allows designers to refine their ideas before exposing their objects to external scrutiny. Contrary to what is currently promoted as an innovation practice, Designer Entrepreneurs do not position the user explicitly at the core of the process at the start of their entrepreneurial journey. Rather they start by taking care of their own needs, desires and ambitions. It is a selfish act that pays off in the drive, effort and sense of authorship that keep them working without any short-term reward or payoff. Another reward gained in this self-centred process is the profound connection that they develop with their products; translating it into incredible attention to detail and enrichment of the story behind the product. On the downside, this impassioned sense of ownership experienced by designers about their products can make them less receptive to stakeholders' feedback. This tendency to downplay critique, blur the capacity to make sound business judgements in their entrepreneurial journey.

The story behind the product encompasses the story of the entrepreneur, the product and the start-up, which altogether provide credibility to the venture.

They experience a strong sense of accomplishment when, as a result of their creative act, their wit, acumen, style, originality and effectiveness of their objects and their organizations are appraised and admired by their audience. This study called this phenomenon: authorship.

The designer´s approach to setting up a business promotes the trial and error approach over the analytical method, yet, as the venture matures Designer Entrepreneurs learn how to navigate in a more analytical domain. This flexible initial approach leads the designer to gain traction, trust and motivation around their product idea.

Why

Designer Entrepreneurs are emerging in an ecosystem where making mistakes gets cheaper every day, having as a consequence a boost in their learning curve. The available platforms, tools

and services are built to try out new proposals for as little money as possible, in a relatively small period of time. This paradigm shift enhances the opportunity to learn by trial and error, making an effectual logic to set up a company affordable.

In overcrowded markets, functionality and aesthetics are close to being commoditized. DE create meaningful solutions due to their story making abilities, their sense of artistic and configurator authorship and the skillset proper to product design realm.

CHAPTER 7 – CONTRIBUTIONS AND CONCLUSIONS

7.1 Introduction to the Chapter

This chapter concludes the study by presenting a summary of the contributions to knowledge, contributions to the CGT methodology, implications for the Design and Entrepreneurship theory and limitations of the study. In relation to the **contribution to knowledge**, this research presents three key contributions that to the Design Entrepreneurship area of knowledge: ***a) Geppetto effect*** – the designer´s feeling of authorship presented as an asset throughout; ***b) Mindset plasticity*** – How designers evolve their thinking, abilities and attitudes as the product and the new venture start to take shape and consolidate; and ***c) Cognitive harmony and dissonance*** – why designers tend to take early business decisions based on an effectual logic and why it creates a mental discomfort to take rational business decisions in a later stage of the start-up.

In relation to the **methodological contributions**, there are two claims that this study presents: ***a) Doodle mapping*** – the use of concept maps portrayed in the form of drawn doodles, used to synthesize the information during multiple stages of the research (literature review, data collection and analysis of the data) and also used as an analytical tool, as a prompt to be used during the interview process and as a visual memo; and ***b) Voice-over videos*** – a video of the doodle maps with a voice over that help the interviewee understand the comprehensive perspective of the research and make sense of it in a reduced time frame.

This chapter concludes by discussing two **implications for academics and practitioners** emerging from this research: ***a) DE as a vehicle to attain innovation*** and ***b) DE as an abnormal discipline (para-discipline).***

This chapter also presents the **limitations of the study** in related to the ***a) Sample size***, the ***b) Reduced network and pool of participants*** and the need for a ***c) Longitudinal study***. To conclude the chapter, the **future** strands of **research** in the area of Design Entrepreneurship are presented. There is a need for a ***a) Longitudinal study of designer and Non-Designer Entrepreneurs***; a thorough update and revision of the ***b) Ecosystem*** (technologies, socio-cultural issues, economics and education); and the ***c) Mindset of designer-leaders in design companies.***

7.2 Theoretical contributions

7.2.1 The Geppetto effect and the sense of authorship

As depicted by the effectual logic, "who am I?" is one of the first things expert entrepreneurs know before setting out in an entrepreneurial journey. The answer to this question is the entrepreneurs' identity. The participants of this study conceived their products as an extension of who they were, passing on the beliefs and capabilities as designers to the products they created. Designers spent considerable time to express perfection, attention to detail and a need to achieve a sense of authorship through the purpose and characteristics of the product. This ongoing search for perfection stopped the entrepreneurial venture, but it gained authenticity, which later on was needed to reach out to potential users. As expressed by Valencia and Pearce (2019):

> *"By the "Geppetto Effect," we mean the search for perfect craftsmanship that becomes a double-edged sword, because it focuses on the excellence of execution of a product rather than the development of the company formed to market that product. It was an approach that all of the entrepreneurs admitted to increased the time and expense of product development and business setup. Essentially, their attention to detail and the determination to stick to their vision worked against them in establishing a commercial enterprise. At the same time, there were some advantages. This identity-giving process reinforced the story behind the product - a story that became very useful in inspiring sales. Crowdfunding sites supported these companies even when they didn't yet have a fully operational product—because of the stories. Backers were looking at the product through a human as well as a business lens. They enjoyed supporting it because that struggle resonated with their lives, values, and experiences. Certainly, a product's story and identity can influence public perception".*

As described in Chapter 5.17, the designer's authorship is divided into three concepts: artistic, craft and design. ***Artistic authorship*** is portrayed by the philosophical stand of the entrepreneur. It does not follow any external brief and is mostly based on the personal context and personal values of the designer. The product/start-up satisfies the designer´s emotional needs, providing meaning and alignment to their values and context. ***Design authorship*** seeks out alignment with brand values, follows an external brief and pursues social validation. The

client/user needs are at the forefront of the priorities. ***Craft authorship*** concentrates the designer's attention on the mastery of execution, the aesthetic response and the merit attained by the skills and taste of the designer. The design flair and good taste reside within this authorship.

The authorship experienced by designer-entrepreneurs can be divided into two categories, ***inside-out authorship*** (the Geppetto Effect), shown on the left in figure 95, and the ***outside-in authorship*** shown on the right-hand side. The distinctiveness between these is discussed in the following section. Designer Entrepreneurs showed that during the entrepreneurial journey, they had a natural propensity to a specific authorship.

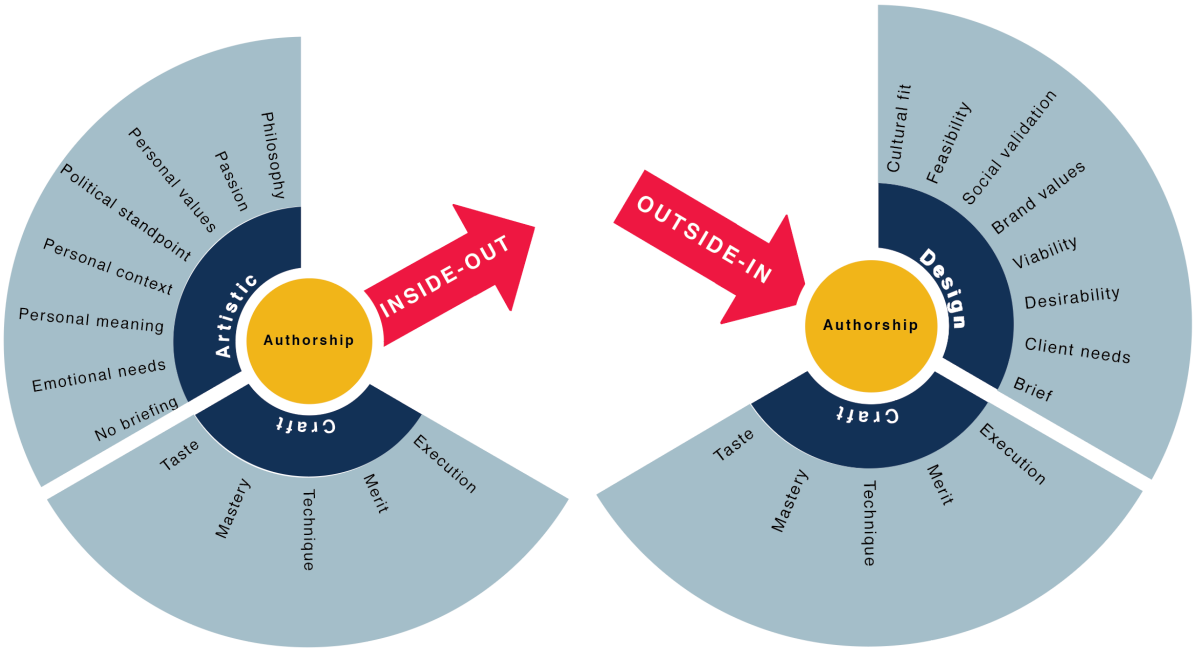


Figure 95. On the left-hand side, the inside-out authorship; on the right-hand side, the outside-in authorship.

7.2.1.1 Inside-out authorship (Geppetto Effect)

Shown on the left-hand side of figure 102, where the personal values of the entrepreneur shape the object and the company; this process is more intimate to the individual ethos.

Designers under this effect took each product decision very thoughtfully. They worked hard to achieve alignment or coherence between the product and their vision and intent. In effect, this was an inside-out process, since these designers created items that were meaningful to themselves.

The researcher called this “the Geppetto effect” after the impoverished woodcarver who made the puppet Pinocchio in Carlo Colloid’s famous fantasy adventure (1883). It features a master carpenter who was given a special block of wood to work with, a block of wood that spoke to him, whereupon he carved it into a boy.

Designers spent more time finding the solutions within themselves, crafting the product up to a point to transfer their identity to the object. This type of authorship represents a mixed blessing where the designer´s search for perfection and attention to the product detailing hindered the progress of the start-up. However, designers with this type of authorship achieved outstanding recognition from their communities. There is an evident coherence between “the ethos” of the product, the start-up and the “*mastermind*” behind them. It is worth noting that Designer Entrepreneurs with the artistic authorship considered their peers (knowledgeable designers) as their audience. Multiple contest and prizes, even recognition from international authorities in the design discipline helped them to build a good reputation even when the sales were scarce.

7.2.1.2 Outside-in authorship:

The second type of authorship is when the product is the result of a systematic process such as design thinking. In this case, designers play the role of interpreters, collecting the needs and opinions to form a better understanding of the problem, and the potential leads to futures solutions.

The researcher called this “the designer´s authorship” as shown on the right-hand side of figure 102. In this process, the answer comes from the users and the designer´s ability to synthesise the abstract information and configure a solution; This is an outside-in process where the information and the validation come from the outside world. This authorship appraises viability, desirability and feasibility, which speed up the development process.

7.2.2 The mindset plasticity

Designers in this study have shown their ability to adapt and change their mindset as a result of their entrepreneurial journey. Becoming entrepreneurs demanded that designers transformed their beliefs, attitudes and paradigms. This study identified four different mindsets that DE experienced in their entrepreneurial journey: the artisan, the configurator, the opportunity seeker and the design-leader; a comprehensive description of each one of them is presented in Chapter 5.15.2. There is a progression made from the artisan mindset to the design-leader mindset, it shifts from an effectual logic towards a casual logic, without excluding the learnings obtained in previous stages. This means that the ability to change “identities” and priorities without losing the

design intent is what differentiates a Designer Entrepreneur in a consumer product start-up from Entrepreneurs without this design philosophy and approach. The Designer Entrepreneur's design intent becomes the driving force throughout the process and remains central to decision-making.

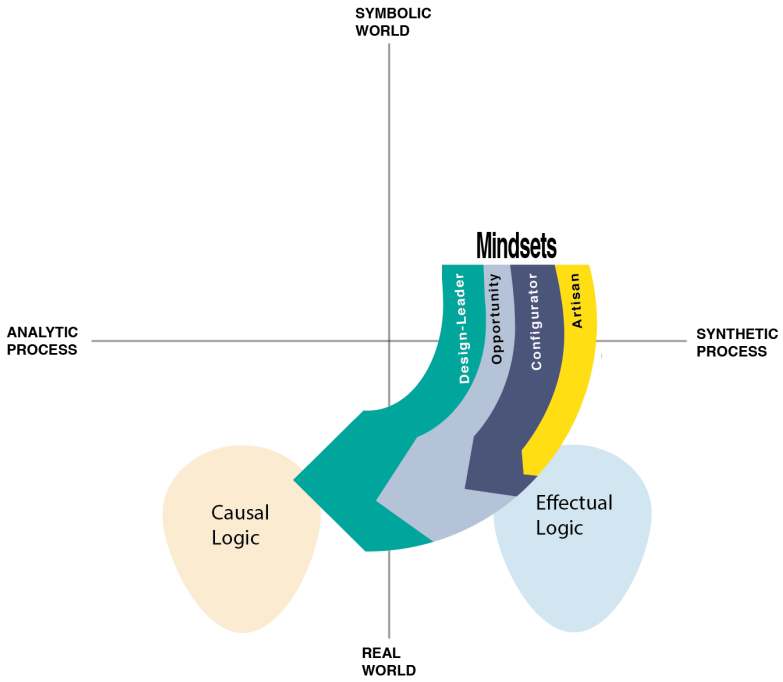


Figure 96. Evolution of Designer Entrepreneur´s mindset as a mechanism to mediate the cognitive dissonance between the design and business realm. Please refer to the video on the footnote[7].

Figure 96 shows how the artisan mindset crosses from a symbolic to a real-world, but continuing to prioritise the synthesis of ideas (referred to as a synthetic process by Owen, 2006). It is the differences between having some constraints such as following a brief or perusing something more than self-expression. The configurator spends more time materialising the product and the business. Activities outside the designer´s area of expertise are avoided. In areas where previous knowledge is scarce, such as market research, business plan and logistics, the Designer Entrepreneur adopts a make-do approach. The opportunity mindset is right before crossing the axis that divides the synthetic from the analytical process, finding support in activities and processes that are oblivious to their profession.

[7] Video of the mindsets:

To grow and refine the business, Designer Entrepreneurs gradually adapted their logic, actions, processes and priorities towards more business savvy analysis, without losing their design intentions for the overall experience of the product. The mindsets build on top of each other, and the way they avoid having conflicts is by prioritizing whether the product decisions affect the business or vice versa.

- In the pre-early stage (**artisan mindset - *yellow arrow***), where the tinkering takes place, the priority is to experiment and become skilful with materials or technologies. This stage happens at university, in a workshop, in the studio, and involves the direct interaction between the individual and the materials, tools, machinery, and new technology.
- In the early stage (**configurator mindset – *blue arrow***), where the configuration of the product and the basic business model is explored, the priority is to find the value proposition and integrate the product into the big system.
- In the growth stage (**opportunity seeker mindset – *light blue arrow***), where the focus is to set up a business capable of growing and starting competing in big markets, the priority is to automate the process, to gain speed and attract investment to the company. Flexibility on the management and delegation of the task provides Designer Entrepreneurs with the advantage to steer the company.
- In the expansion stage (**design-leader mindset – *green arrow***), where the focus of the company is to increase their market share, introduce more products of the similar family into the market or to expand into different regions, the priority is to have a solid product-business model that can be replicated or adapted into different countries. The mindset of the entrepreneur utilizes design as a key differentiator against his/her competitors.

7.2.3 Cognitive harmony and dissonance

As entrepreneurs move forward through the start-up journey, when the decisions have a more transcendental impact on the future of the company and the risk becomes higher, the need for a more structured and systematic approach to set up the business and draw upon opportunities has to be more analytical. This is also known as Casual logic (Sarasvathy, 2008). It is worth noticing that the hands-on nature of the tasks that Designer Entrepreneurs carry out at the beginning of the start-up clashes with more analytical tasks required at this stage. This transition is influenced by the maturity of the business and the ambition of the Designer Entrepreneur.

Causation concentrates on the predictable aspects of an uncertain future. Conversely, effectuation focus on controllable aspects of an unpredictable future (Sarasvathy, 2008). Business schools have traditionally focused more on the causal logic, on analytical tools and methods to manage known problems. Causal logic is used by MBAs to exploit existing knowledge, focusing on business planning, calculations and portfolio diversification (Sarasvathy, 2008). In a study run by Kirby (2004), MBA students showed a lower propensity to be entrepreneurial compared to individuals without any formal business education. Knight (2013) found that potential entrepreneurs can be encouraged or discouraged by business school programs. A 2017 study produced for Bloomberg showed that on average, only 3% of the MBA graduates in the USA continue their professional careers as entrepreneurs soon after finishing their studies (Bloomberg, 2017).

Designer Entrepreneurs in the current study acquired new knowledge in the business domain during the transition from Configuration to Opportunity mindset. Consistently with Sarasvathy (2006; 2008), entrepreneurs sought out ways to back up their decisions whenever those decisions could compromise the future of the company. In other words, the bigger the business decisions, the more support required from business tools.

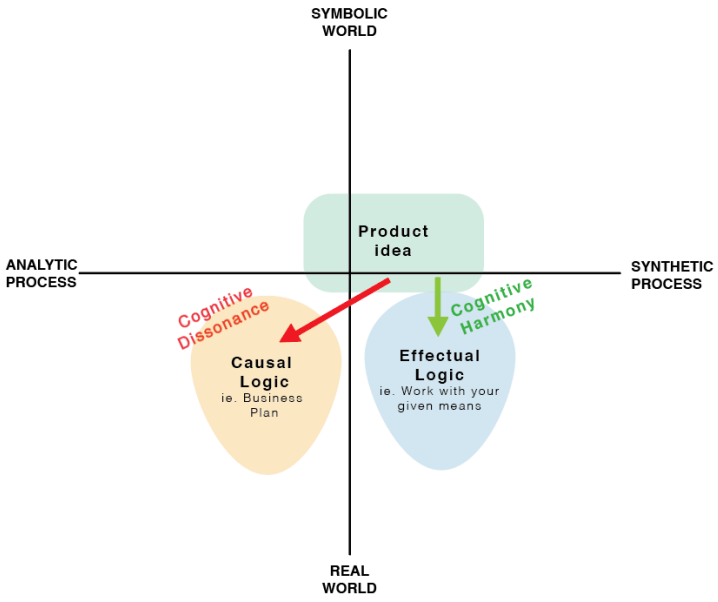


Figure 97. Cognitive dissonance (red arrow) and cognitive harmony (green arrow) based in Owen (2006) and Sarasvathy (2008).

Figure 97 summarises the above mentioned. It is based on Owen (2006) and Sarasvathy (2008). It can be seen how the flow is interrupted when the analytical approach to business is taken by designers, breaking down the consistency in which designers think and act. This process to toggle between effectual and casual logic demands from DE´s tolerance and the ability to work under different logics.

Effectual logic had proven effective to help individuals to set up a company, however as the business grows, the limitations of effectual logic undermine the potential of the entrepreneur and the start-up (Sarasvathy, 2008).

7.3 Methodological contributions

As stated by Simon (1988), Design belongs to the realm of the sciences concerned with configuring artefacts to attain specific goals. Sarasvathy (2003) considered entrepreneurship being part of these sciences called "sciences of the artificial"; in the case of this study, both Design and Entrepreneurship can be regarded as part of it. Designers create objects with a given purpose so solve a specific problem; and on the other hand, entrepreneurs design firms to change and bring products or services to solve a particular need, desire or problem.

Design research methods are still settling in academia. Design research has not a definite way of conducting research. It is still drawing upon other more established research methods. This study has been informed by the Constructivist Grounded Theory, which allowed the researcher to have a ***more flexible*** approach to the classical GT and ***adopt new tools*** and ***methods*** to collect and record data. The methodological contributions are the ones that Design can share with other disciplines, such as visual maps of doodles as an analytical tool and the voice-over videos of the maps of doodles as a quick introduction of the research and recap of any progress made before the interview. This helps the interviewer and the interviewee to:

- Make sense of the information quickly
- Use it as a prompt to start the conversation
- A way to report the findings to the participants
- A visual method to ask for feedback
- Abductive analytical tool
- Visual aid to share the progress between the researcher and his supervision team

7.3.1 Doodle mapping as an abductive tool

Contrary to the inductive or deductive reasoning, abduction does not jump from a premise to a conclusion. Instead, abductive reasoning rules out all possible explanations of an issue, until the final most probable one is left given the evidence. It is a useful way to get around confusing situations when there is no clear evidence or prior studies. As Dorst (2015) explains, there are two types of abductive reasoning. The normal abduction and the design abduction. Abductive reasoning starts knowing the intended Outcome. Then the two other elements, the What and the How are developed in parallel. There are no known or chosen What or How, therefore, the design abduction has to take that creative leap and devise proposals to find what and how and test them in conjunction.

The design abduction proposed by Dorst (2015) referred to the product creation process (consumer goods, graphic design, service design, etc.). However, this research broadens the application of the design abduction into the research field. This research has followed a more design abductive approach, which is compatible with the Constructivist Grounded Theory.

The object is the doodle map, which helps the researcher make sense of the study; also, it is used as an analytical tool to come up with the final theory. In this case, the *"What"* is the pieces of knowledge coming from different disciplines that need to be weaved, the *"How"* are the methods and tools that comprise the methodology and the *"Outcome"* is the theory of the Design Entrepreneur´s transition.

As shown in Chapter 3.4, visual maps allowed the researcher to communicate information which cannot be easily shared in a written or verbal form; this is information that is time-consuming to explain and also challenging to contextualize. In this study, the researcher used the doodle map as both prompt and analytical tool. This means that the researcher used doodles to synthesize concepts difficult to disentangle in words, and then inter-connected those concepts to bring about a big picture of the issue. In the process, the researcher made sense of the vast amount of information available and made visible where the gaps in the knowledge were. The researcher used these maps with his participants during the data collection phases and also in the validation stage. The feedback given by his participants modified the original map, adding new concepts (in the form of doodles drawn by the participants) and the interrelationship between the concepts (made by the participants also). The use of maps allowed the researcher to create a systemic

comprehension of the issue; where the ecosystem and context influence the understanding of the issue in focus.

7.3.2 Steps for doodle-mapping

Firstly, the map of doodles needs to represent the concepts of existing theories involved in the study.

Secondly, it needs to show the cause and effect of the elements of the main issue. It needs to show the interrelation among concepts and theories that help explain the main topic. This map will make evident any flimsy argument or missing gap in the information collected. The map should show the research as a system of elements that help explain the issue. Doodle mapping helps the researcher during the interviews as a visual prompt. The participant can skim through the map and get the general idea of the study.

Thirdly, this map is an inductive tool of the analysis of the issue. The researcher taps into this map to find multiple explanations of the emergent findings and potential loose ends of the main argument of the study. The doodle map shows all the possible connections between the elements of the issue and whether the information was sufficient or not to move forward. This doodle mapping promotes the abductive reasoning; the researcher rules out visually with a connecting line, the explanations that are not strong enough or the ones that do not present enough evidence.

Lastly, the final theory (the path formed by the connecting line) is taken out from the maps as one of the most plausible explanations of the issue.

7.3.2 Voice over videos

Multi-media aids (maps of doodles with voice-over comments) were developed as a way to support the researcher to reach out to potential participants for the study. The implications of the methods in this study suggest that introductory animated videos summarize the research outline faster, allowing the viewer to grasp the topic being presented in a few minutes.

The doodles were significantly more appealing to watch than reports and presentations in slides as many of the interviewees claimed. They also prepared the participant with a broader context and the current researcher´s understanding of the topic before an interview or a meeting.

The acceptance of multi-media tools by the interviewees in this research made evident to the researcher the value of doodle mapping in Qualitative Research and Constructivist Grounded

Theory. It opens the discussion on the addition of the latest visual technologies such as drawing apps on electronic tablets to be used for memo writing, record evidence and as a prompt.

7.4 Implications for academics and practitioners

8.4.1 Design Entrepreneurship as a vehicle to attain innovation

Innovation means different things for a Designer Entrepreneur than for a corporate designer. Designers in established companies have a relatively straightforward task. Innovation means to follow a brief to improve or change or develop a new product, service or process. They are a small mesh from a big machinery. However, in the case of a Designer Entrepreneur, innovation means start from scratch, with no brief to create a new product, service or system alongside the new venture with a high dose of uncertainty coming from the unknown users, market conditions and funding.

In this case, innovation entwines with entrepreneurship and design.

The term innovation has multiple definitions. To overcome this ambiguity, Baregheh (2009) synthesised a diagrammatic definition of innovation, shown in figure 98.

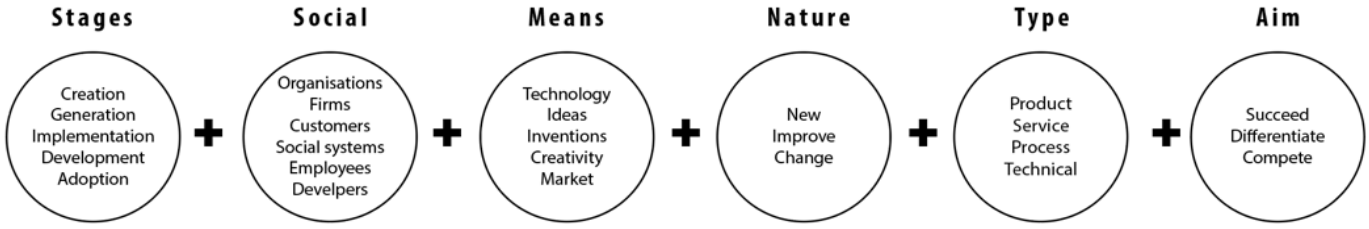


Figure 98. A diagrammatic definition of innovation (Baregheh, 2009).

> *"Innovation is a multi-stage process whereby organisations transform ideas into new/improved products, service or processes, to advance, compete and differentiate themselves successfully in their marketplace" (Baregheh, 2009).*

More than a hundred models for creativity, design, entrepreneurship and innovation have been catalogued by researchers (Howard, 2008; Baregheh 2009; VanPatter and Pastor, 2017) starting by the Helmholtz description of the creative process in 1826 (Howard et al., 2008) up to the latest Design Sprint (Knapp et al., 2016) and Radical Innovation of Meanings (Verganti, 2016).

Similarly, VanPatter and Pastor (2017) spanned more than 80 years of innovation processes available on the literature across diverse knowledge arenas, to come up with a visual framework

that simplifies the understanding of this process. Some of the processes analysed in VanPatter and Pastor cover creative, design and innovative process that share similarities between each other.

Figure 99. Simplified model of the innovation process (VanPetter, 2016).

In figure 99, VanPetter proposed this simplified model to generalize what stages the innovation processes have and in which quadrant each particular process have more incidences. As Figure ASD shows, there is no consideration about how this process applies to set up a company, and far from it, how a designer can start a product-based company.

Some authors include on their definitions that validation must be met in order to consider that innovation has been attained, that is, the product or service must have an economic, social or cultural impact (Schumpeter, 1912; Kline and Rosenberg, 1986; Rothwell, 1992, 1994; Žižlavsk, 2013; Dong, 2015, Global Innovation index, 2016).

Despite all the available information on how to develop a new product and establish a new company, there is a lack of information that explains or guides the personal transition experienced by Designer Entrepreneurs when they set up a company. The mindset and the authorship of the entrepreneur support throughout the innovation process. The Mindset and Authorship of designers are parallel processes that happen across the evolution of the product and the start-up. Figure 100 adds the elements of Authorship and Mindset as part of the innovation definition for design entrepreneurs in consumer product start-ups.

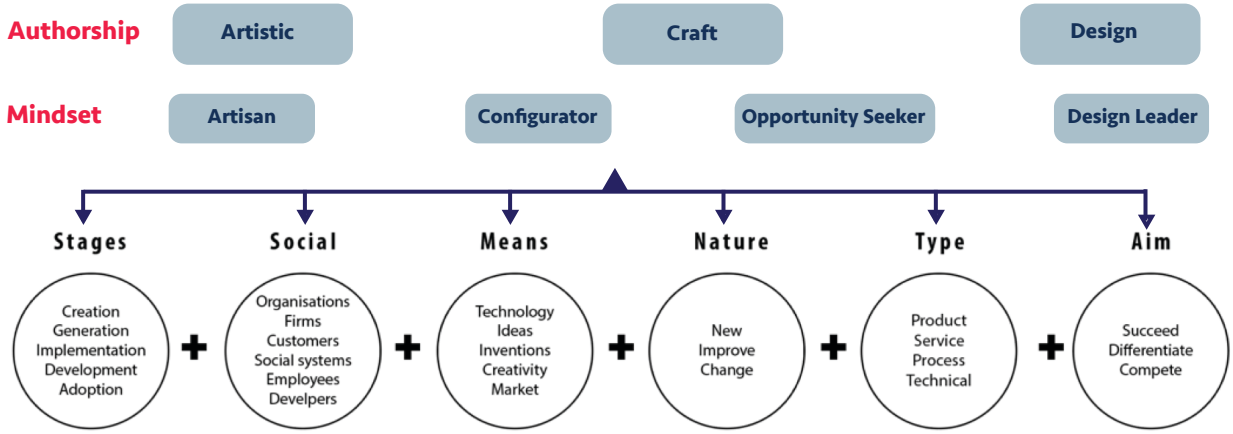


Figure 100. Proposed definition of innovation for design entrepreneurs in consumer product start-ups.

8.4.2 Design Entrepreneurship as an abnormal discipline (para-discipline)

A process is a systematic series of steps with a specific aim, and a discipline is a branch of knowledge that is thought at university. The changes have moulded the transformation of Design as a "discipline" in professionalism, economy and technology.

Bremner and Rodgers refer to it as "The crisis of design" (2013).

Bremner and Rodgers (2013) describe the multiple levels that Design, as a discipline has experienced throughout the years, moving forward Design towards an *undisciplinary* state, where: "[Design] has shifted from being discipline-based to issue or "project-based"; an ability to mash together jumbled ideas and methods from a number of different, distinct disciplinary practices that can be brought together to create unexpected ways of working and new projects. Displays an "anything goes" mindset that is not inhibited by well-confirmed theories or established working practices" (Bremner and Rodgers, 2013, pp.12).

The "anything-goes" mindset describes that the undisciplined approach does not fit with Design Entrepreneurship. The evidence in the study suggests the accumulative development of the mindset. The opportunity seeker and the design leader mindset showed that established working practices and well-confirmed theories could have a positive impact on the performance of the start-up. Thus, Design Entrepreneurship, as a transformation of the design discipline, cannot be entirely classified as undisciplined, but rather as a para-disciplinary.

Young et al., (2017) describe the design approach as *para*[8]*-disciplinary* in response to what Bremner and Rodgers (2013) referred to as *undisciplined*.

Design is *"Acting between, beside and beyond existing disciplinary categorizations […] we cannot describe [the design] approach as inter, multi or undisciplinary"* (Young et al., 2017). This affirmation expands the design capacity away from the disciplinary classification.

The nature of Designer Entrepreneurs as agents of change require a flexible definition that can follow them across the wide variety of roles, activities, methods and tools utilized all across the entrepreneurial journey.

7.5 Limitations

This study presents limitations in the scope of designer entrepreneurs, sample size, the length of the study and the pool of participants. They are conditions that the researcher could not control and were out of his hand.

7.5.1 Sample size

This study required a more in-depth view of a smaller sample to discover unexplored elements of design entrepreneurship. To make a more robust study, a bigger sample could help the researcher to generalize the findings to a wider audience.

7.5.2 Longitudinal study

This research carried out a cross-sectional study that allows the researcher to gain access to a great deal of insight from a wide range of actors in the entrepreneurial ecosystem. Access to designer entrepreneurs was more challenging due to their limited availability and continuous pressures of running their businesses. More time with designer entrepreneurs and an internal monitor scheme inside the start-up would make considerable new findings and richer conclusions.

7.5.3 Pool of participants

Designers come in such a variety of specialities. This study focused on designer entrepreneurs in consumer product start-up, nevertheless, there are other profiles of designer entrepreneurs that could be added in further studies such as graphic, service and web designers.

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[8] ***Para*** is a prefix for abnormal or beyond (Webster Dictionary, 2019)

7.5.4 Personal budget and funding

All the data collected in this research depended on the personal budget that the student had at hand. This demanded the student to come up with creative ways to stretch out the budget to build the network from scratch, create visual aids, buy the basic supplies to record the interviews and attend to conferences, events and meet ups. A couple of congresses were partially financed by the University (cost of registration only).

7.6 Future studies

This research can serve as a basis for a number of future studies.

7.6.1 A longitudinal study of Designer Entrepreneurs and Non-Designer Entrepreneurs

This study has been faithful to the methodological rules of CGT, however, it is impossible to claim that the study has kept track of all the changes experienced by DEs, since the study depends on how accurate DE recall the events and details. To address this, a longitudinal study conducted in real-time could overcome this potential recall bias. An action research study could place the researcher inside the organizations to conduct a more ethnographic oriented study.

On the other hand, this study has identified some elements of the mindset that can be boiled down into variables/constructs that allow the researcher run a quantitative study to determine in a larger sample whether Designer Entrepreneurs experience that transition or not.

On a similar note, placing the start-up at the centre of the study rather than the entrepreneur could also be valuable for managerial studies. It could shed some light into the way designers perform leadership inside the organisation.

7.6.2 The ecosystem

A further study comparing designer´s ecosystems would elucidate how the access to technology, education, platforms, services and events influence the performance of designer entrepreneurs. This research shed some light onto the influence of the DE context leveraging the way they design, innovate and set up consumer product start-ups. A descriptive study could be useful to see the interaction between the elements of the ecosystem and their impact on designer entrepreneurs. It is important to keep track on the changes that society and technology have, because designers rely heavily on them.

This study could also include the way designer entrepreneurs are tapping into this ecosystem to expand the role of design as a discipline.

7.6.3 Mindset of Designer-leaders in design companies.

An exploration into how the DE´s mindset evolved as they became leaders in large businesses, would further extend the understanding of Designer Entrepreneurs developed in this study. A bigger sample of designer-leaders is needed to come to solid conclusions. These insights can be valuable to designer entrepreneurs in earlier stages and postgraduate studies in Design and Entrepreneurship.

7.6.4 The application in other fields

This research concentrated solely on DE in consumer product start-ups. However, most of the findings might be transferable to other areas of design such as: software, service, fashion or even game design. An extended study is highly suggested to compare if the findings and the claims are transferable to other areas of design.

CHAPTER 8: TRUSTWORTHINESS OF THE STUDY AND THE EXPERT´S VALIDATION

Dimension	Element	Methods to improve trustworthiness
Credibility	Internal validity	a) Adoption of research methods well established b) Development of an early familiarity with the culture of participating organisations c) Random sampling d) Triangulation. e) Tactics to help ensure honesty in informants f) Iterative questioning g) Negative case analysis, h) Frequent debriefing sessions i) Peer scrutiny of the research project j) Researcher's "reflective commentary" k) Background, qualifications and experience of the investigator l) Member checks m) Thick description of the phenomenon under scrutiny n) Examination of previous research findings o) Prolonged engagement with participants

8.1 Introduction to the chapter

This study has collected and analysed the experiences of a cross-section of stakeholders, first within the consumer product development ecosystem and subsequently from Designer Entrepreneurs. This chapter discuss the way the data collected has been analysed and interpreted by the researcher to achieve findings that can be trusted. In qualitative research studies, the model of trust criteria is met with concerns such ad credibility, transferability, confirmability and dependability, of the whole study.

8.2 Trustworthiness

In compliance with the internal validity aforementioned in **Chapter 3.2.2**, the researcher followed the recommendations from Charmaz (2006), Moerman, (2016), Sikolia et al. (2013) and Shenton, (2004) to increase the trustworthiness of the study.

8.2.1 Credibility in the study

This section explains how the researcher followed Chapter 3.2.2.1 to achieve the credibility of the study.

The researcher adopted the Constructivist Grounded Theory approach which has been proven as a sound and robust qualitative research method, (Mills et al., 2006; Charmaz, 2006) validating the point of adopting well-stablished research methods.

The researcher utilized the interview model and the think-aloud protocol (including the visual imagery) as a method of triangulation to provide multiple facets to the same phenomena (point d of table 5). Moreover, the investigator triangulated the findings with existent theory in Chapter 3.2.2.1. Theory of triangulation involves more than one theoretical framework in the interpretation of the data, showing if the findings hold opposite viewpoints or share related points between them (Turner and Turner, 2012). Chapter 2 and 5 provided theoretical support to build the literature review and the discussion of the findings, respectively.

The research team (principal and second supervisor) have accompanied the principal researcher throughout the whole study to ensure the frequent debriefing sessions. This impacted on the method, literacy and results of the study.

The peer scrutiny of the research project has been attained by the three international publications, one international award and four presentations in international conferences, as well as three presentations in doctoral seminars and his research informing his teaching practice with master's students in design management at Northumbria University (evidence shown in Annex G).

The researcher's reflectivity commentary is shown by the produced memos and visual imagery that helped the researcher attain a progressive subjectivity, as described by Guba and Lincoln (1989), to monitor the researcher´s development of constructions, critical in establishing credibility.

The researcher utilized his experience as a consultant in design for business innovation and lecturer in strategic design to promote his study. As per Maykut and Morehouse (1994), the professional information of the researcher should be included and is relevant to the study.

A member´s check was conducted with some participants. The member´s check is when the participants are asked to revise the transcription of their interview, to see if their words match their intentions, or if the researcher captured what they intended. To conduct this, the researcher transcribed the interviews and the think-aloud protocol and map them alongside the key milestones of the entrepreneurs. The researcher showed in a later interview, the results of the first interview to some of the participants to know if they could add something and if they consent the content.

Figure 101. Member's Check for internal validity (point l). A transcription of the interview model and the think aloud protocol was presented to the participants to review, and confirm that the information they shared was accurately captured by the researcher.

Chapter 3.1 shows an extensive description of the methodology, while Chapter 4.8 shows the results obtained in Phase Two data collection. A thick description of the phenomenon under scrutiny is provided, allowing the reader to assess how well the defined elements of the DECPI typology embrace the facts and the emergence of the newly appearing themes. This point serves the purpose of informing the reader about the internal validity and the external validity of the study (Cooney, 2010).

Chapter 5.13 employs previous research to examine how the findings of this study relates to the existent theories, setting up the ground to elaborate the new theory from the discussion between them.

8.2.2 Transferability - External Validity

Transferability addresses the element of external validity of the study, it describes whether the results of the research can be generalized or transferred to other contexts. It is necessary for the researcher to make explicit the connections between the contexts, details about where the research took place to help the reader to construct the scene that surrounds the research study. As Korstjens and Moser (2018) claim:

> *"The reader, not you [the researcher], makes the transferability judgment because you [the researcher] do not know their specific settings".*

To facilitate this point to the reader, the next paragraphs present a summary of the chapters that present information accountable for the transferability of the study.

Chapter 4.3 presents a description of the sample selected for the study. Chapter 4.3.1 presents data coming from academic experts; Chapter 6.3.2 presents data coming from Investors; Chapter 4.3.3 presents business incubators & accelerators; Chapter 4.3.4 presents data of the platforms and events; Chapter 4.3.5 shows data of Non-Designer Entrepreneurs and Chapter 4.3.6 shows data of designer's entrepreneurs. Chapter 4.7 share 3 different images that help the reader to see the overall roadmap of the interviews made, the chronology of the Phase One data collection and how the snowballing effect took place.

Chapter 4.11 shows details of the participants of Phase Two data collection and presents details about the data collection; Chapter 4.7.1 complements this by showing a chronology of interviews; Chapter 4.9 represents a summary of the Phase Two data collection; 4.11 shows a description on the participants and their start-ups. Due to confidentiality issues, limited information can be shared in this study.

Chapter 5 comprise the comprehensive description of the research findings, discussion and how the theory emerged from the data. Chapter 5.12 shows the findings of the study.

Chapter 7.2.1 includes the point of view of experts in the field and two Designer Entrepreneurs that appraised the findings and the resulting theory. It presents the point of view of experts in the field of entrepreneurship and design.

In Annex I, a summary of the memos, visual notes, emails, invitations, events and interactions with the participants is shown.

8.2.3 Dependability and Confirmability

Lincoln and Guba (1989) argued that there is a close link between credibility and dependability and they can be achieved by overlapping methods. In this study the interview model and the think-aloud activity helped the researcher to capture multiple dimensions of the phenomenon. The gap of time between the interview and the think aloud protocol are a few weeks or even months, giving the interviewee the opportunity to reflect about their journey, and for the researcher to ask more specific questions.

Another advantage of using these two methods was the triangulation of data, assuring the internal validity of the research (Bowen 2009; Brown et al. 2002; Jacelyn and O'Dell 2005). Shenton (2004) described how triangulation improves the trustworthiness and the quality of the result of the study. Another point to ensure the dependability and the confirmability of the study is to perform an in-depth coverage where an external reader to the study can assess the extent to

which rational decisions following proper research practices have been made. Gribbin (2018) utilized the audit trail as strategy to establish research confirmability and dependability.

8.2.4 Information for the audit trail

The researcher provides a comprehensive amount of data generated throughout the study. Annex A, B, D, E, F, G, I and J can be consulted to by an external examiner to conduct an audit trail. As Guba and Lincoln (1982) alleged, all the documents should be kept for crosschecking the inquiry process, this includes, transcripts, audio files, observation notes, memos, documents generated and anything that contains data from the fieldwork.

8.2.5 Stepwise replication

In Annex F the stepwise replication followed by the study can be found. An adaptation of the work of Gribbin (2018) and Birt et al., (2016) was made. A random selection of ten extracts of the interview transcriptions were provided to the external participants along with the codebook developed from the DICPI typology and the emerged themes in Phase Two data collection.

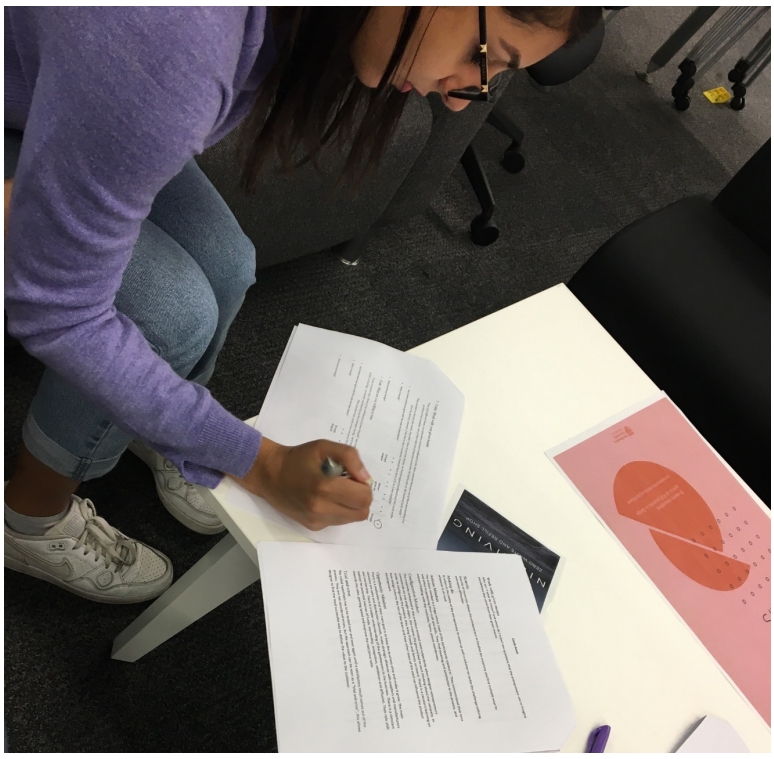

Figure 102. Colleagues at the Design School at Northumbria University collaborating for the stepwise replication for the research project.

8.2.6 Results of the Stepwise replication

The feedback received on the inquiry audit showed agreement among the three reviewers and the codes utilized by the researcher. One reviewer presented a slight disagreement on the themes:

8.2.7 Opportunity mindset and form partnerships.

The discussion was whether the code "form partnerships" was a subtheme within the overarching "opportunity mindset" code. This rearrangement of themes had to be reconsidered and helped the researcher to improve the final DECPI typology. The definitions remained the same for both codes.

Two main issues arose from the stepwise replication:

a) Scarcity and Make-do

In the case of the theme scarcity, three of the participants found coherence between the excerpt and its code. However, one participant disagreed completely. In figure 103 the results of an example of the results delivered by the platform (Google forms) is shown.

One of the comments referred to a lack of context in the quote, and another comment referred to that this code belonged to the configuration mindset instead.

Scarcity

"We tried to save money, we did everything ourselves, we did everything by hand, but there was a point when we had to look for more efficient ways to make our products.

The excerpt can include a bit of context to avoid any confusion, yet, the concept of the theme refers to the need many designers present to be "jack of all trades" at the beginning of the start-up since there is a very limited amount of money on the entrepreneur's hand. This lack of resources motivates the designer to find new ways to do things.

A similar situation arose with the make-do theme.

Three of the four evaluators found coherence between the description provided by the Code Book and the excerpt of the transcripts. There was one evaluator who found a discrepancy between the code and its definition. For her, this extract belonged to the scarcity code.

Make do

"I believe that a designer-entrepreneur has to adapt, it has to be very creative to utilize what it is available, and what can be done in time, budget and processes" F3.

In this case, the researcher talked to the evaluator. She had a misunderstanding of the concept and also the meaning in English of the term "make do". What she did was to use the meaning of the word make and the word do, and tried to find traces of that in the excerpt presented. To clarify that, the researcher presented the definition of the dictionary to her "to manage to live without things that you would like to have" (Cambridge dictionary, 2019). Then, she read the excerpt again and discussed the new meaning this concept had in her mind. She agreed that there was no discrepancy.

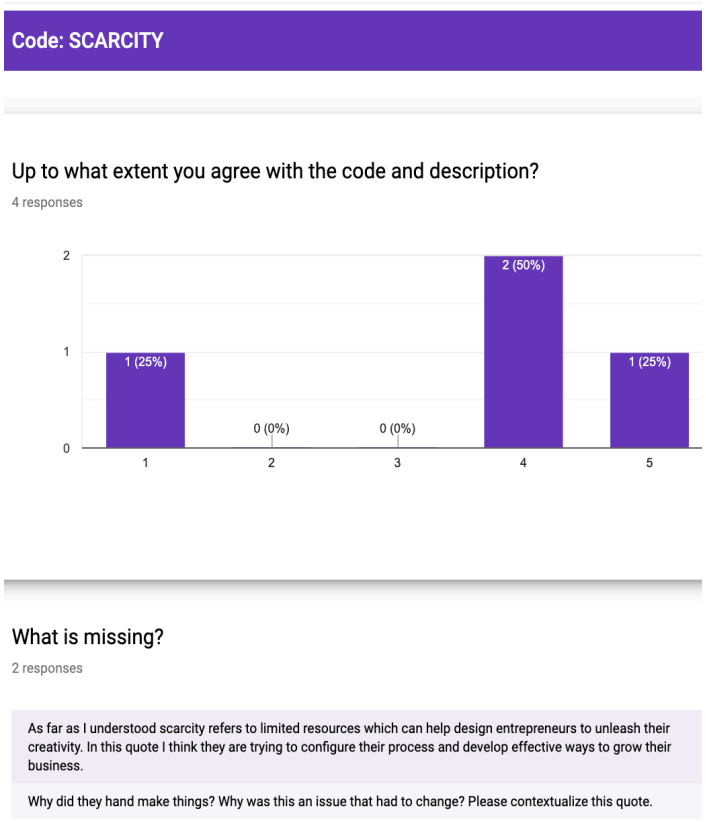

Figure 103. Results presented for the code Scarcity

b) Human centre design had to change to Human Centre Design Methodology

Three of the four evaluators agreed with the description of this theme and the definition presented in the Code Book. One of the evaluators suggested that this theme referred to a formal

methodology. His suggestions were taken into consideration, because the researcher recognized that in his code he referred to the HCD methodology indeed.

The excerpt presented was the following one:

> *"I had to start my final year and design a product from start to finish. I wanted to find the biggest challenge for city cyclists and tackle it, so about six months of that year was spent working with a ton of other cyclists, working with the driving psychologists working with the bus company in the council and being out on the roads myself… …once I did the deep dive I realized that actually, what was the real problem"*

8.2.8 Code-recode strategy

For this point, the researcher ran twice the analysis process through the data collected in Phase Two. Two notebooks were used to facilitate the researcher to differentiate the two runs of the analysis. Anney (2014) suggest: *"giving one- or two-weeks' gestation period between each coding"* to see if the results are similar or different between each other.

The similarity of the codes was significant between the two notebooks. As an example, Figure 104 shows the two notebooks referring to similar concepts. On the left-hand side, Figure 104 shows the code "Configuration" where the notes were taken on the 26th of July, 2019; and on the right-hand side, it shows the code "Configuration Mindset" where the notes were taken on 2nd of August 2019.

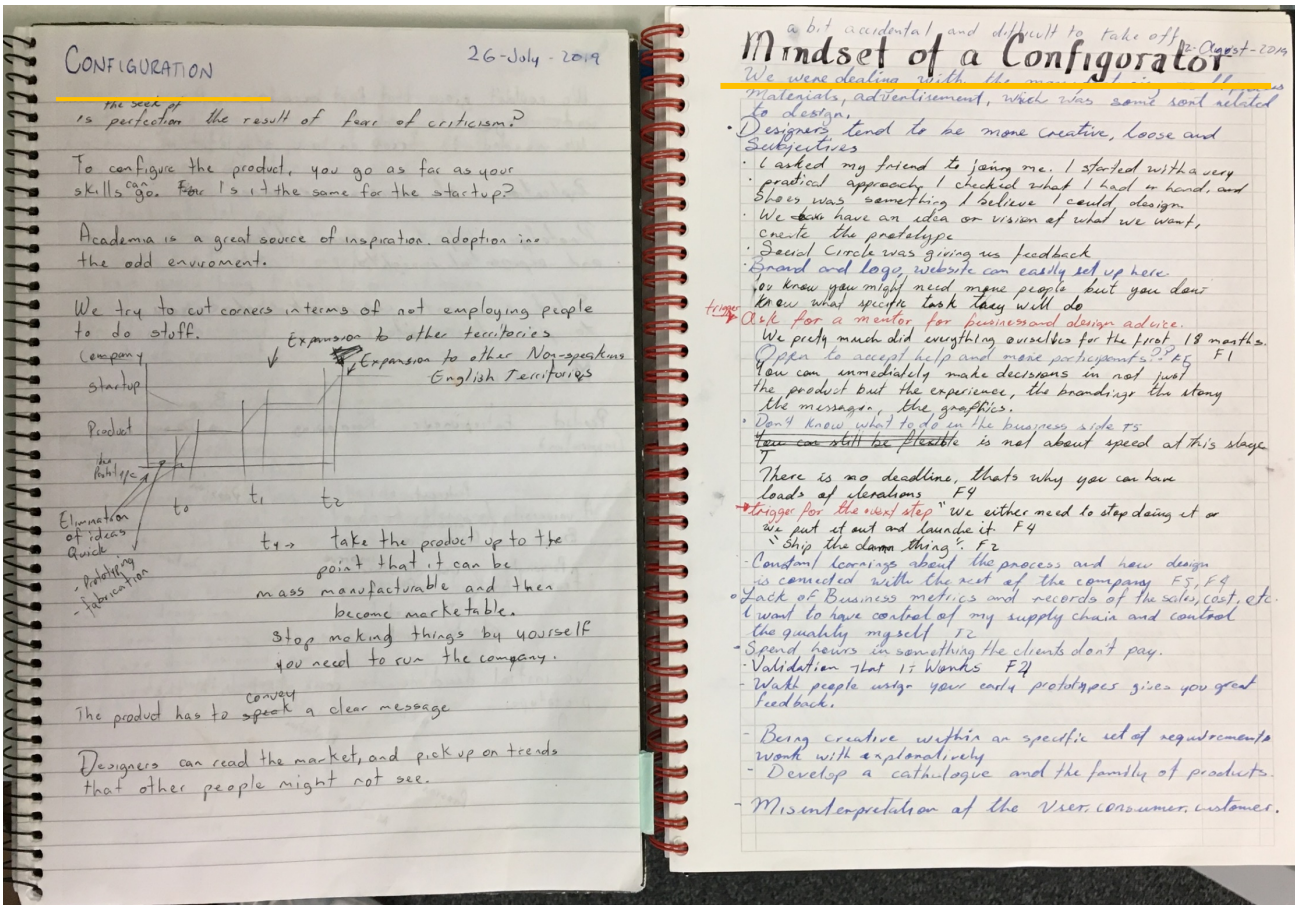

Figure 104. Notes taken during the analysis process of Phase Two data collection. On the left-hand side, the date of the memo is 26th of July, 2019, and on the right-hand side, the memo is 2nd of August 2019.

Similarly, figure 105 shows similarities on the concepts. On left-hand side shows the codes "Design Leadership" and "Advantage mindset", in the same way, notes on the right-hand side shows the code "Mindset of a Leader

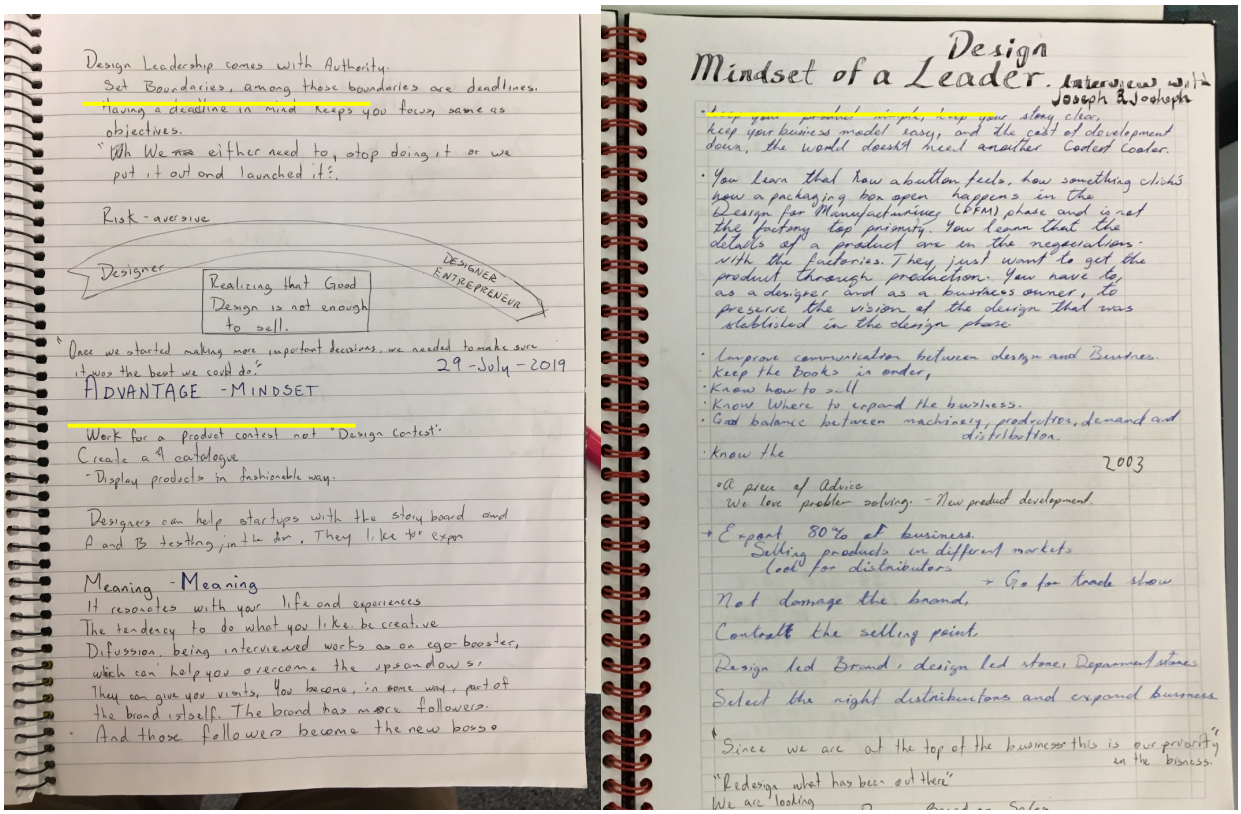

Figure 105. Notes on the left-hand side shows the codes "Design Leadership" and "Advantage mindset", in the same way, notes on the right-hand side shows the code "Mindset of a Leader".

8.3 The expert´s validation

This research is based on the experiences of individuals who play an active role in new product innovation and new venture creation. The specific interest of this study became the transition that designers experienced when they commenced their entrepreneurial journey. Chapter 5.13 contrasted the findings with existing theories from the management and design fields. However, the findings require a critique from people who is currently at the frontier to practice and knowledge. This section of Chapter 7.3 presents the opinion and commentary of expert Designer Entrepreneurs and professional experts on new product development and new business creation.

The expert validation of the findings is a critical part of this study. To validate the findings of the study, the researcher put together the corresponding timeline of the designer´s journey and created a set of cards with a summary of the findings. The cards contained a brief explanation of each of the findings. The designer then was asked to give their impressions about it. The primary

purpose was to find out if the ideas shown in this study resonate with their reflections and further opportunities for the research.

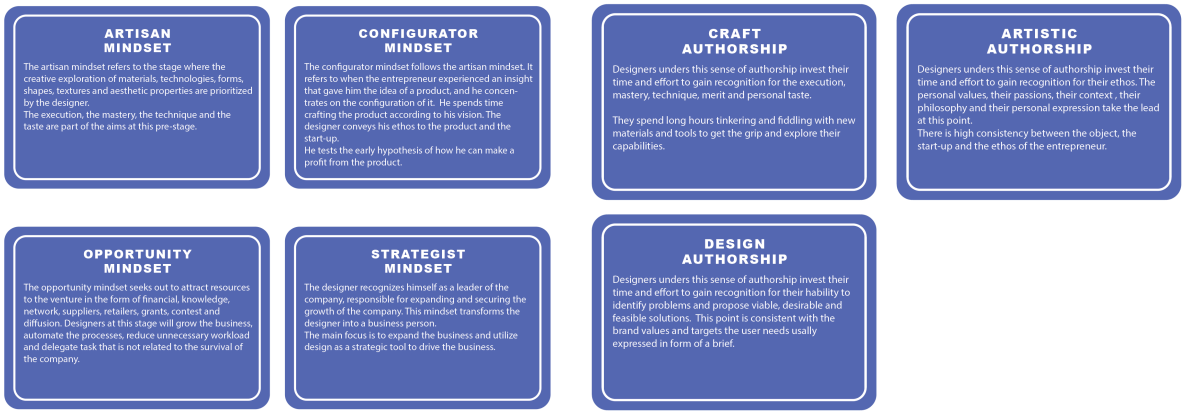

Figure 106. Extract of the cards presented to the experts in order to retrieve their impressions and opinions on the matter.

Founder 1 and 2 were selected as Designer Entrepreneur experts on the topic. They were asked to revise the findings and provide their critique from their Designer Entrepreneurial standpoint, On the same line, a professional expert in new product development (Expert 1) with more than 60 products developed worldwide was asked to give their thoughts about the findings and provide a critique on the new product development process followed by the entrepreneurs and the findings of the study; Lastly, an expert in incubation (Expert 2) and acceleration in new products was asked to provide his critique on the way the participants started their business and the findings of the study.

8.3.1 Founder 1

F1 could resonate with the four stages of the mindset, and the three different authorships presented. His comments questioned the benefits of each stage. In the case of having a second product, does this lack of naivety make you less creative? Or that makes the designer more risk-averse? How could this artisan mindset craft authorship repeatable?

These questions are outside of the focus of this investigation; however, these comments gave the researcher ideas for further studies. Once F1 was shown his timeline, he commented that if he could start all over again, he would have focused his efforts in the design for manufacturing area. He would have gone through the same steps because he is overall satisfied with how things turned out.

8.3.2 Founder 2

For F2, design in the UK is tied together with arts education. Having spent his life in Canada, Italy and the UK, she could tell the difference between the Design Schools in Canada and Europe. For her, it is more common to see the Artisan authorship in Europe, due to the connection that the designs schools have with the school of arts and architecture. On the other hand, in Canada, Design can be based on an engineering or an architecture school. It favours the development of the designer authorship. She recognized that for her, one of the biggest problems, when she started her company, was to be able to get rid of the artisan authorship and the need for recognition from her peers. Nonetheless, she claims that she felt more authentic with her view and in control of the product.

The mindset cards echoed her path. For her, they reflect a traditional problem-solving process and the way that humans adapt their thinking to external situations. The Design-leader or the opportunity mindset are reached when the previous mindsets bring about new learnings. Whether a miscalculation of the sales forecast in Christmas season or how not to apply for a patent, the entrepreneur learns from those mistakes and become more cautious, less inattentive on the business side of the business.

8.3.3 Product Manager - New Product Development, Inozen, Shenzhen China.

The researcher asked her opinion on the way the participants of this study developed their products. According to her, there is no right process set in stone to develop a product. There are multiple routes to design a product, however, in her perspective, just right after having the idea, the Engineering validation test is critical, since it is the core of the product they are developing. The second mistake that she found was the late market research in all cases. To perform these two steps, Designer Entrepreneurs do not need significant amounts of capital; they need more structure. The third mistake she found was that in some cases, the focus in participating in a contest delayed the development of the product and hindered its intellectual property.

The expert pointed out that the decision of putting off far-flung manufacturing is an error in many of the cases. If designers want to keep things local, they will control the production and work with minimum orders. But once your product is out, it can be quickly overtaken by someone that can produce them cheaper and in larger quantities.

Design and manufacturing are two different worlds and work under different rules. The expert commented that one of the errors product entrepreneurs made is thinking that winning the contest will help to sell products, which should be the ultimate goal for any start-up. However, factories do not care about the awards or prizes; they only care about the number of pieces you will ask them to do. They want to be safe that you are going to stay with them; if you are asking them to produce the tools, you need to ask them for big numbers and show them you have the cash to start the production. Their strategy is to pre-launch the product in Shenzhen, China; where the buyers of the most famous retail in the world are keeping up with new trends and inventions. They pre-launch the product to receive orders, not feedback. The best feedback comes from people that want to change the colour, or the form, the telecommunication platforms, or to add some nuances to the object, but willing to place an immediate order. In consumer products speed is essential due to "Shanzhai phenomena" (the act of producing counterfeit consumer goods) that happen in many factories in China. Therefore, taking the time to better the product is not an option. The best way to prevent this problem is the speed of development.

8.3.4 The product experts´ view

The investigator asked the expert in product development her opinion on the research findings. She said that she could relate to the way design is being thought in the UK compared to China. She majored in Industrial Design and Technology at Brunel University. She mentioned that in the UK, the emphasis in design education is in the ideation part, where getting out of the ordinary is appraised. The fact of having access to workshops (wood, metal and such) gives the designer a closer feeling of the object he is creating. Her opinion was that this stimulates new ways to interpret the world and thinking outside the box. The downside of that is that the results are products that cannot be manufactured not to mention scalable. In China, design education has a more technical background; it focuses on the functionality and the manufacturability of the products. The mechanisms and the manufacturing process have a predominant role in design education. In China, it is common not to have access to wood or metal workshops. The low price of prototyping with the cutting-edge technologies in China, alienate students to spend time doing the prototype. The downside of it is that students struggle to get out of the box, conforming to what is known and proven. She claims that these findings would have to be contrasted with how design operates in manufacturing countries like China.

In her perspective, the most important is the speed of development and testing the product with the market. Buyers from major retailers around the world want what is new, and if that new thing is expensive, they just have to wait a few months, and a knock off brand will have it.

The timeframe also changes the way to develop a product. She saw the product development timeframe of some participants and her critique was that taking the time to develop an idea that is new is illogical. Her comments were that designers need to receive feedback from buyers, especially in the consumer product sector.

> *"If we have only 2 weeks to develop the product, we would have to accept the price and the process that our partners can offer, but if we have more time, let's say 3 months, we can negotiate with our electronics partner, our mechanical partners to develop a more strategic plan for the product".*

Two weeks do not give enough time to iterate many times. We have to leave enough cushion for design mistakes and errors from our manufacturers, but then again, that makes a product more expensive and not looking and doing all the desire specifications.

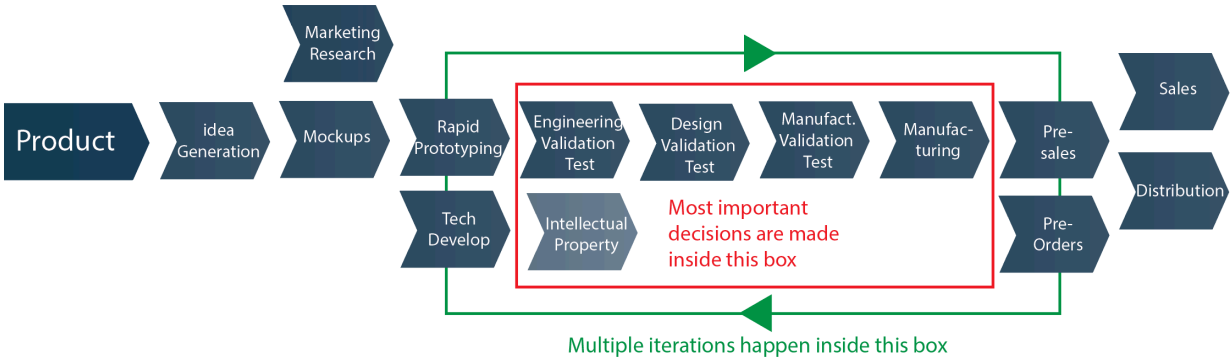

Figure 107. The general model which "the expert" develops a product.

The advantage of being in the Shenzhen area is that the manufacturing partners can speed up the process. The combinations of new technologies, materials and tools favour the combinational thinking of designers. It inspires designers from other parts of the world to come down to Shenzhen, China and expand their available means. This ecosystem enhances the effectual logic of entrepreneurs.

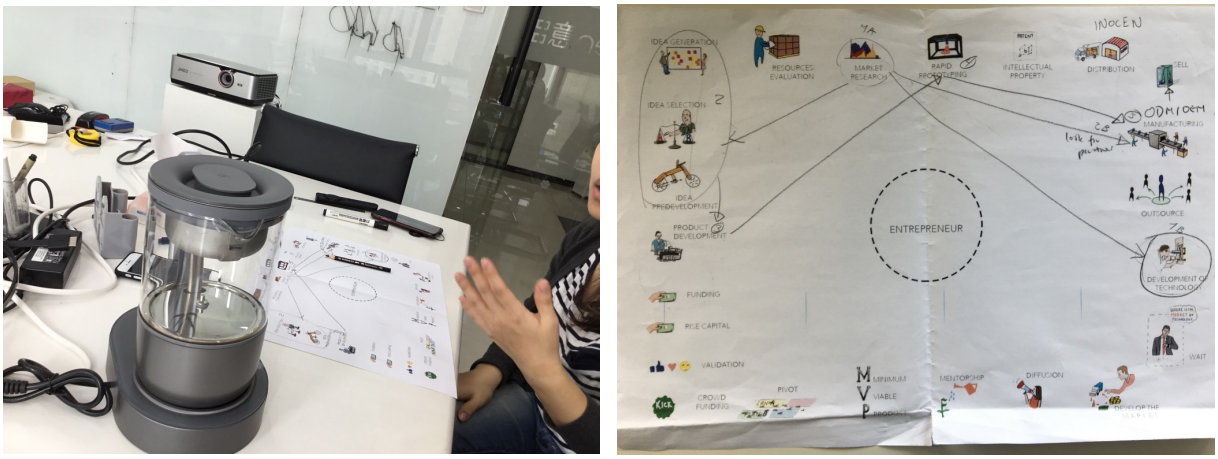

Figure 108. The expert in Shenzhen, China, has a portfolio with more than 60 products develop for international start-ups under her management.

The advantage of having a designer as an entrepreneur is that you can ask them what they want and they would be able to have a good idea of how the product should look like, functions and the overall experience.

8.3.4 Enterprise manager Incubator and accelerator

Expert 2 was invited to the study to provide his feedback on the findings of this research. He has nine years of experience in the area of new venture creation and enterprise management in the northeast of the UK.

8.3.5 The enterprise experts´ view

About the entrepreneurial journey of the participants, expert 2 pointed out that market research was something he would suggest doing earlier in the process. For him the idea is generated once the market research has given a hint of an opportunity. The business case is the backbone of the company, and it dictates the direction of the company and the product strategy. The entrepreneur can have an invention, but before spending more time and money, even before patenting the invention, it is required to size the market and see if there might be a possibility to get a profit out of it. In a broad sense, the entrepreneur has to minimize the risk of spending money in something that does not have potential.

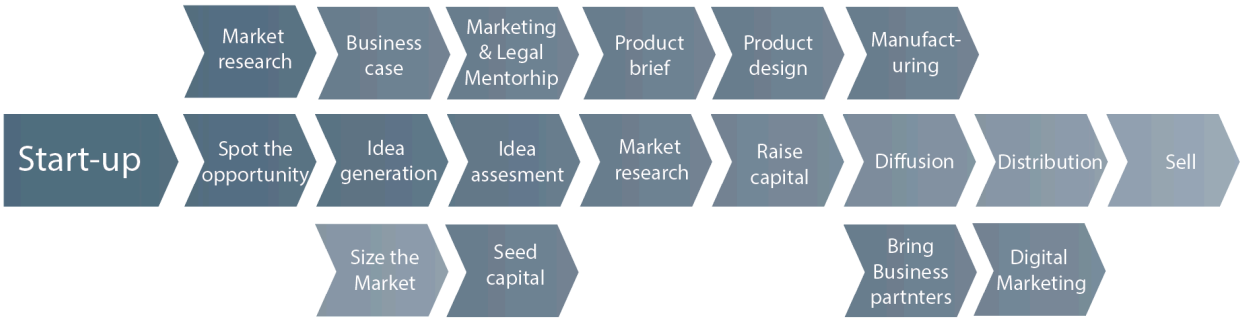

Figure 109. A generic view on the process that consumer product start-ups set up their venture based on the expert's opinion.

8.3.6 About Authorship

Entrepreneurs seek recognition, but not in the public sense. It is more about the recognition of their peers and the impact they are making. The designer might look for perfection in the product, but that it will not take the product off the ground.

Designers rely heavily on the images to sell the products, but it can be misleading. The representations generate expectations that in most cases, are hard to fulfil. The idea is so clear in terms of the function, the user and the aesthetics that pivoting it is hard or almost impossible for them.

The professional process looks for market validation before the product. Design tends to be more idealistic on their objectives, trying to achieve big goal, but there is no plan to support them.

8.3.7 About the mindsets

For expert 2, the proposed mindsets of the study and the product life cycle act in following each other. When the product and the company are yet to be tested, many ideas can come around, and nothing have a severe consequence. However, as the product, the start-up and the market get serious, the decisions need to be made based on reliable information. Figure 110 shows one of sessions with one of the experts from the business field.

Figure 110. Expert comments on the findings of the research.

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Annex A – SCRIPT OF THE VIDEO

Script of the of the Map´s Video

This is an extract from the multimedia produced for the interviewees.

Voice: Aldo Valencia

Audience: Roberto Verganti, POLIMI

Date: 8th November, 2017

Transcript of the script

Researcher: - Hi, thank you very much for your time Roberto, I decided to present my work in this way for you. I think it'd be easier just to grasp the main idea of what I'm doing.

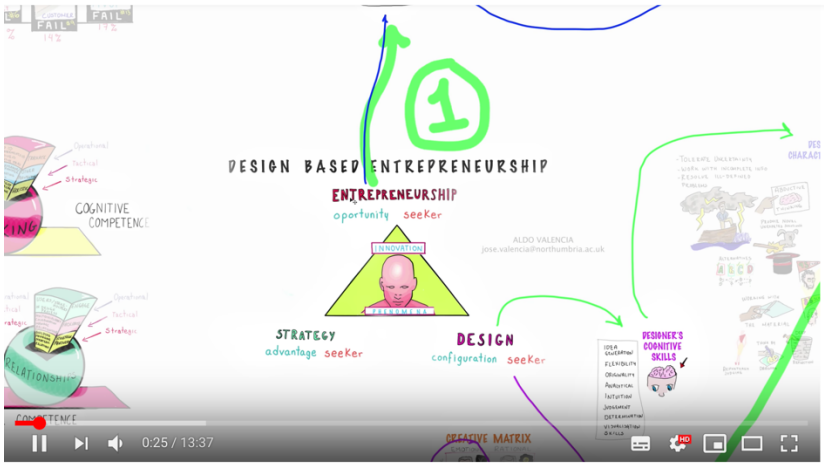


Figure 111. Screenshot.

Researcher: "I'm starting from the innovation mindset. I've been reading different articles and they support the idea the opportunity seeker, as entrepreneurial mindset and the advantage seeker for the strategic mindset. I'm adding to his equation the design mindset. For me the design mindset can be called "configuration seeker". The literature is supporting this idea but I wanted to define it in one word".

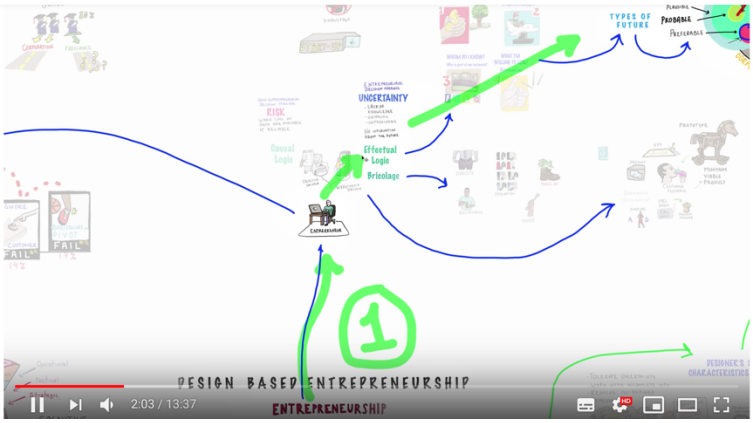


Figure 112. Screenshot 2.

Researcher: "The Entrepreneur is conducting this effort to create its own business. It has two different paths: the first one it's called causal logic. It's more step by step approach to solve the problem. So, in a way it's following the rules from the business school offered nowadays. It's more about risk management and how to avoid it. It's very much related to have historical data and previous information about the market to make decisions. The hypothesis driven approach or the effectual logic it's more useful when launching a product in a new market. In this case, entrepreneurs are dealing with uncertainty and when they are dealing with uncertainty, they need this exploration mindset. How to gather information when there is no information available? And how to take decisions faster? Then we can move towards the most famous methodologies for product development, such as "the Lean Startup" approach, but I'm not focusing on them, because there's plenty of information available. These two logics are gaining more traction because they are based on principles not steps".

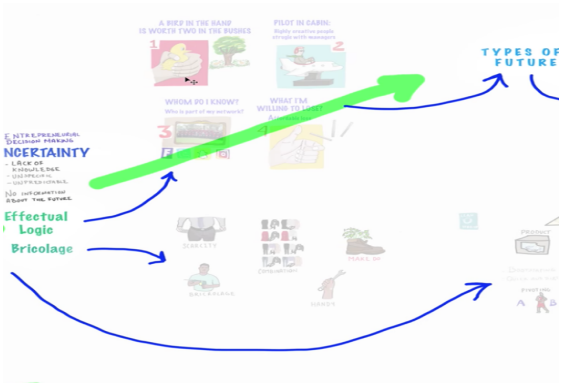


Figure 113. Screenshot 3.

Researcher: "These are the principles. So, this is something that got my attention because I believe that every single start-up starts in different conditions and also have different stages. I find really interesting the concept of scarcity, not only as a source of creativity but also it focuses on your attention. So, when you're dealing with not enough funding or not enough personal or not the right conditions to create something then it is going to activate your creativity in order to overcome problems. Effectual logic and bricolage start with scarcity, so I believe they are aligned with my approach".

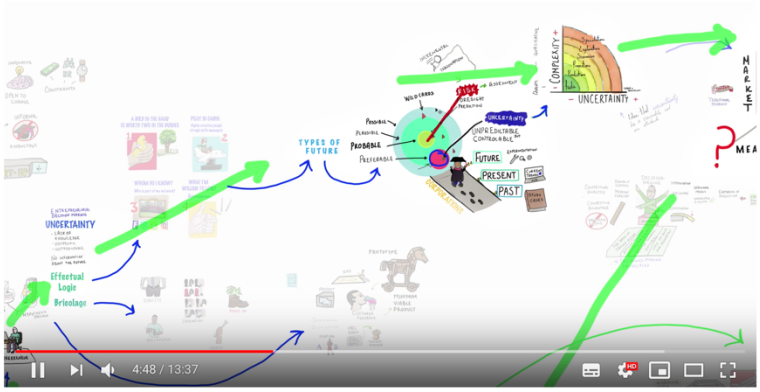


Figure 114. Screenshot 4.

Researchers: "Another part that I find really interesting is that there are different types of futures. Just to mention quickly there's four types of futures according to some academics. The biggest one is the "possible one", in this future we (humans) can fly and we can grow wings and we can develop whatever it's in our head. This is the biggest future possible, then we have the plausible one the one that is typed by the current laws of physics or small down-to-earth in a way and then the probable one the one that is based on previous data historical data information that it's available. So, for example in this one, if I tell you that Mexico is going to be a first world country by 2018, well there's not that many information available that support this claim. The last one is the preferable future. It's between the plausible and the possible. I believe Entrepreneurs work in this one up to what extent. At in some point these requires people envisioning different futures, interpreting differently the reality".

Figure 115. Screenshot 5.

Researcher: "They are tied in a way of what's happening nowadays but also, they can shape the future so it's toggling between these two futures. The one that I believe designers and entrepreneurs are working in new environments and new products & new markets".

Researcher: "I want to focus my work in the scenarios. Between facts and speculations and something that allow me to have a little bit of control of what can be happening tomorrow but also at some point having this opportunity to shape the future that we want as a start-up". I found plenty of information about the different type of interpretation of what's happening out there, but nothing much about meaning. Your colleague Oz has been working on this and I really like your work because it changed the perception of meaning in design thinking.

Annex B – SEMI-STRUCTURED INTERVIEW

Interviews in Phase Two

This inductive process allowed the researcher to specify and narrow down the study. This stage culminated in the researcher carefully crafting a revised set of questions with the help of the supervision team, considering the elements that would answer the research questions in Phase Two.

Northumbria University
NEWCASTLE

Study title: The expanded role of design:
the case of designer entrepreneurs in hardware start-ups

Section ·1/3

Introduction by the researcher

First of all, thank you for your time.
This interview is part of my research in the area of Design and Innovation conducted in the design school at Northumbria University, United Kingdom.
I want to know about your start-up and how you faced your challenges on a daily basis.
I´m researching what the main characteristics of the designer-entrepreneur are. What did you bring to the table when start-up your business?
This study is being conducted in the UK, between April and October 2018. All personal information will be treated in confidence. It will be dealt with in such a manner as not to compromise the personal dignity of the participant or to infringe upon their right to privacy. The consent form will provide you with the details on how your data will be handled and your identity anonymised.
As part of the protocol, I need your permission for tape recording or note-taking.
This interview should take less than 30mins.

Contact details for any follow up questions

To begin, I´d like to check that the details I have for you are correct:

Name:	Date:
Company:	Years in operation:
Industry:	Background:
Location:	Preferred way to be contacted:

Outline of the semi-structured interview

This interview will consist of 5 main topics:
Background - I´ll focus on who you are and why you ended up starting your own business.
The Early Days - I will be looking to understand all the factors involved in the conception of the idea.
The Process - How you create your company/product. How was the process from idea to launch? I highly appreciate if you can give me as many details as you can since the main body of information will come from this place for my research.
Working with other disciplines - What decisions you have faced that involves more disciplines, and how you sort them out.
Reflections- what have you learnt about this journey and how would you advise future designers-entrepreneurs.

Northumbria University NEWCASTLE

Section 2/3

Semi-structured interview questions

Introduction

Before jumping into the early days of your project/start up, let´s start with your Background.

Can you tell me about your previous experiences?

Early days

Where did the idea come from?

What made you decide this idea was more than a simple prototype?

Tell me about the other cofounders, their roles and how they contributed to the start-up?

Describe their backgrounds?

At the very beginning, what resources, tools, network, and technologies did you have at hand?

The process

Would you describe your company´s strategy as a Human-Centred, Tech Driven or Market Driven? why?

What is your experience in preparing business plans?

Can you tell me about any experience in a design/business contest that you have participated in?

From the following list ***[Handout the list]***, choose the three items that you think you have learnt more through this process of starting your own business.

Aesthetics
Styling
Decoration
Interaction
User-cantered
Ergonomics
Mechanical Engineering
Electrical Engineering
Industrial Engineering
Material sciences

Environment
Pricing
Distribution
Brand
Management
Finances
Intellectual Property
Sales

Did you have any misconceptions about them?
What did you learn?

Annex C – BROCHURE

Brochures and Flyers

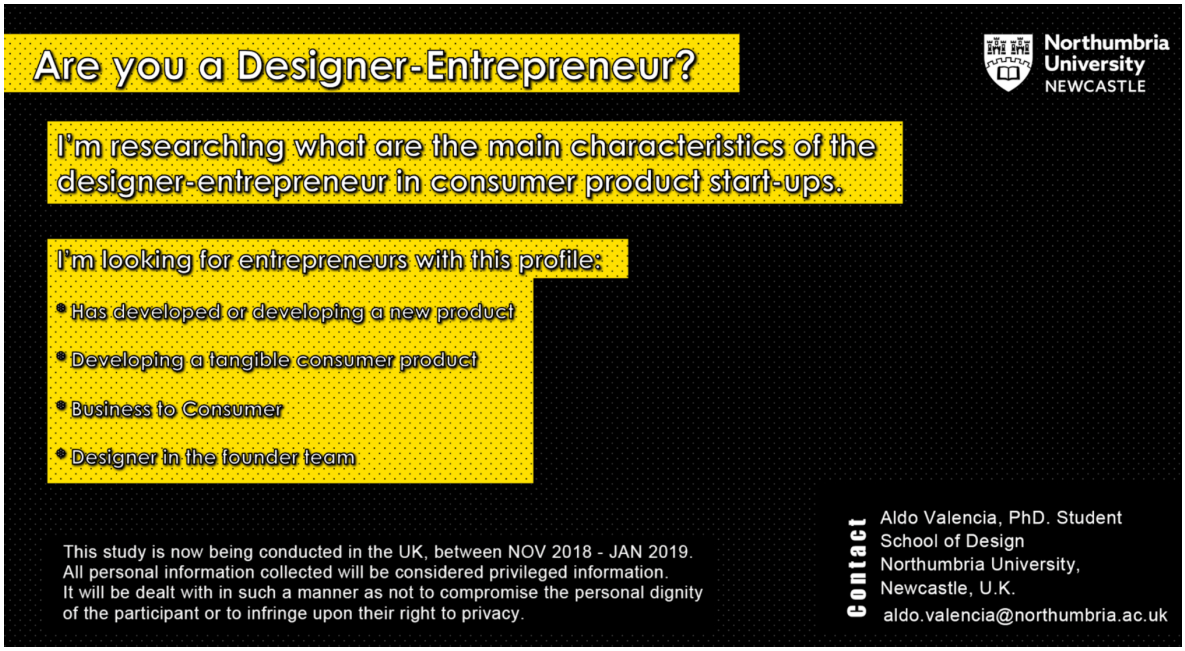


Figure 116. Flyer for online distribution.

This flayer has shared online through the researcher's network and new people introduced at events.

Annex D – INSIGHTS

Insights from Academic Experts in Design and Entrepreneurship

Table 32. Insights from Academic Experts in Design and Entrepreneurship.

Insights from Academic Experts in Design and Entrepreneurship		
Insight	**Questions to expand this insight**	**People to address this question**
The entrepreneurial education has been focused on theory, but entrepreneurship is about being action orientated.	Is there any university program that have managed to achieve this blend between theory and action? Could design be the balance of this by adding its action-oriented approach? How can someone become an entrepreneur without any formal qualification?	Academics experts Design entrepreneurs
Problem solving skills are rooted into the entrepreneurs' mind-set, but over qualification can diminish this potential by turning people into an analyst instead of an actor.	How did your bachelor's/masters/PhD contribute to your entrepreneurial journey?	Designer Entrepreneur
Innovation is finding a new way that works, and must be commercial.	Is there any way to recognize when a product will become commercially successfully?	Investors Designer Entrepreneurs
The academic performance cannot predict business performance of individuals.	How can you effectively learn about entrepreneurship?	Investors Design entrepreneurs

		Entrepreneurs
New ventures require criticism to challenge the status quo and retrace what is known or taken for granted about the business sector. This criticism can be found different companies targeting the same individual but not the same market.	How can start-ups create a "critical circle" when they are developing a new product for a new market?	Investors Designer Entrepreneurs Non-Designer Entrepreneurs Platforms
We can assume that the products created by start-ups contain a major doze of meaning since the entrepreneur is closer to each decision, leaving their print into it.	Are Designer Entrepreneurs more effective to listen, translate, synthesize and deliver meaning through their objects?	Designer Entrepreneurs.
The interpretation of "Reality" comes with reflection. It is a different way of seeing problems. It is not what everyone believes they know. Reflection leads you to a different path in innovation.	Entrepreneurs need to be action oriented, does this reflective process hinders their ability to develop their products?	Designer Entrepreneurs Business incubators and accelerators
Insights comes from observing, meaning comes from reflection.	How can design reduce the complexity of it?	Design entrepreneurs
Design thinking should come along design-making	Design thinking and design making are part of designer's skillset, do they have any advantage over the rest "design thinkers"?	Design entrepreneurs Business Incubators & Accel. Academic experts
Innovation is a social process, it is not an act in isolation.	How important is for entrepreneurs to be immerse in an ecosystem to make things happen?	Design entrepreneurs Non-Designer Entrepreneurs

	How can design increase the interaction between people to make things happen?	Business Incubators & Accel. Academic experts
One overlap between design and entrepreneurship is that both learn by doing. “You can read the book How to juggle but that's not going to teach you how to be a good juggle”.	Is there any way to speed up the learning curve in Design/ Entrepreneurship? Does that mean Designers/Entrepreneurs should avoid overthinking? Is trial and error the learning process preferred by Designer Entrepreneurs?	Design entrepreneurs Non-Designer Entrepreneurs Business Incubators & Accel. Academic experts
When design is applied in business, it makes things simpler, allowing non-experts to access to complex ideas easily.	What are the activities done by designers in a start-up? Is the visual approach the only thing they can add to entrepreneurship? Are they applying this to finances, IP, logistics, human resources?	Investors Design entrepreneurs Non-Designer Entrepreneurs Business Incubators & Accel. Academic experts
There are overlaps between Design thinking, Lean start-up, customer development theory, sprints, etc. They are Talking about setting business goals in a hundred different ways.	Is Effectuation against the setting business goals? How does Causal logic and Effectuation work in the previous methodologies?	Design entrepreneurs Business Incubators & Accel. Academic experts
Starting up a consumer product business needs to run parallel the business setting and the product	Is there any right way to start a business? What are the milestones needed?	Design entrepreneurs Business Incubators & Accel.

development to avoid "honking" by the time there is a nice prototype.		Academic experts
The transition from being a designer to becoming an entrepreneur might become designers more confident about investing, and more confident about assessing opportunities.	How can we know this? Is there any evidence that this is true?	Investors Design entrepreneurs Business Incubators & Accel. Academic experts
Designers tend to be very driven by creating the design solution, and that isn´t what entrepreneurship is about. Entrepreneurship is about creating a sustainable business, and a business that makes profit. Sometimes designers maybe get to focus on the design solution and less on the business solution, both are very important.	What are the pros and cons of focusing on the product? Is that because the lack of business acumen or because there is "not good enough" perception about the product.	Designer Entrepreneur Business Incubators & Accel.
Design comes from the art tradition in many schools across the UK. Good artist, the ones that are remembered now, learnt how to sell their work, or they found a Patrons who were giving them money. They produced a lot of art work.	Is the artistic side of Designers hindering their entrepreneurial journey? How can designers learn how to sell their "pieces" without starting up a business? Is there any way to practice it before starting? What are the key learnings they have of selling their work?	Investors Design entrepreneurs Business Incubators & Accel.

The purer the skill in an individual (scientist, designer) the more remote to entrepreneurship or commercial skills	Does that mean that there has to be a mix of skills/knowledge to be able to start up a business? Is that combined with business acumen?	Investors Design entrepreneurs Business Incubators & Accel. Academic experts
"Purist" Designers have a false expectation of the importance of their product and do not have the empathy or the vision why anybody else want to pay this thing they are inventing.	Up to what extent is necessary to listen to the customer's needs? What if the designer has experience in the field and doesn't need to have early feedback? How can he/she know what opinions to listen and what others avoid?	Investors Design entrepreneurs Business Incubators & Accel.
Entrepreneurs tend to disregard customer input, for a long time, because they have a distinctive understanding of the problem/solution.	Is that stubbornness needed to put your ideas forward or that hinders your success because of the lack of customer feedback?	Investors Design entrepreneurs Business Incubators & Accel. Entrepreneurs
A big misconception is that entrepreneurs are risk takers, but in reality, they need to de-risk everything. They are actively looking for ways of mitigate that risk.	How can design contribute to de-risk things in a start-up? Are designers risk takers or risk avoiders?	Investors Design entrepreneurs Business Incubators & Accel. Entrepreneurs

Insights from investors in Product Design.

Table 33. Insights from investors in Product Design.

Insights from investors in Product Design		
Insight	**Questions to expand this insight**	**People to address this question**
Treat your staff as your customers, They will deliver value to your customers for you	Will it be useful if they are human centred driven? Do you train your staff in Design Thinking? Can design thinking align the business goals and product goals across all the start-up interest?	Investors Design entrepreneurs Business Incubators & Accel. Entrepreneurs
The pitch of Design start-ups and Tech start-ups is different. Tech start-ups are very number driven, always thinking about the exit strategy. All of them talk the investor's language Product start- ups don't talk the language investors are used to hearing. It is not about valuation, not formulaic. They are focus on selling the product, and speaking to the regular customers, in their own language. They are driven by putting their product on the hand of the customer. It is about bringing	What is the perception that investors have about this pitch? What is the perception that customers have about this pitch? How do platforms like Kickstarter react to this way of pitching designers have?	Investors Design entrepreneurs Business Incubators & Accel. Entrepreneurs

revenue since day one, that makes them be more active, aligned with value generation in their business		
Most of the people who become entrepreneurs is because it is the only option they have; It challenges people in a lot of ways.	Why do designers want to become entrepreneurs? Are designers trained to become entrepreneurs?	Designer Entrepreneurs Academic experts
The industry demands objects set-up, ready to use. Everything has to be plug and play. It makes things simpler.	Is that change made by designers? What is next?	Designer Entrepreneurs
Doing something really innovative e in hardware is really hard.	Why is that? What triggers innovation in tangible objects? Technology, Market or social changes.	Designer Entrepreneurs Entrepreneurs Business Incubators & Accel.
Software developers in start-ups communicate with each other in the same language. That reduce the complexity of the development process. In a hardware start-up, there is a pile of different design elements. They don't talk the same language and there are few common tools between each other.	How multiple disciplines can build bridges to develop tangible products? (electronics, plastics, structure, software, etc.).	Designer Entrepreneurs Business Incubators and Accel.
The design outcomes depend on your team. Each team needs diversity of thinking, to truly think out of the box.	How divergent you can be when you have investors on your back asking for tangible progress?	Designer Entrepreneurs Entrepreneurs Business Incubators & Accel

	Are there any pros/cons of having multidiscipline in your team?	
Experience is about timing, just because didn't work 5 years ago doesn't mean it shouldn't work today. If you got the right team and the financing everything can work if the timing is right. Conversely, it does not matter if your team or the financing is right but the timing is wrong it's going to fail.	What designer tools can help you to find out the perfect timing? If experience makes you jaded, would you trust in a novice? What areas of the start-up require sufficient expertise?	Designer Entrepreneurs Entrepreneurs Business Incubators & Accel
Experience makes you jaded, you have to leave it at the door. Just work out there and you will find out. You have to leave your experience at the door, because it might leave you jaded. Tenacity is more important than experience.	Tenacity is time consuming, and time in a start-up can be pricey. How did you do it? What kept you going?	Designer Entrepreneurs Entrepreneurs Business Incubators & Accel
Digital manufacturing gives us the ability to innovate and iterate faster. It's becoming easier to become a product start-up that a software product start-up	As soon as 3D printing technologies become more reliable, what would it change in the product design scene?	Designer Entrepreneurs Entrepreneurs Business Incubators & Accel
From the investor point of view, it is easier to find cheap labour in design that in software (Artificial intelligence). If you are building a product, you don't need that resource in-house.	What is the impact to outsource the designer task in a start-up? What can it be outsourced? Would that affect the product and the start-up itself? Does that decrease the velocity of development?	Investors Business incubators & accel.

	What is the impact of having an in-house designer or a designer funder in the team?	
Digital manufactures, communities around the world provide ideas and solutions, abundantly.	Is a lack of ideas the problem? How to identify a great idea from the rest?	Designer Entrepreneurs Investors Business incubators & accel.
Ten years ago, the process involved the manufacturing, the mould, the tooling, doing the first production run, and then going to trade events. Now, in less than thirty days they know if someone wants it to buy. Software adoption takes a lot longer. It can take year to get adoption.	Are designers taping into this ecosystem? What are the metrics designer use to validate their idea? Do designers know metrics to validate their product ideas?	Designer Entrepreneurs Investors Business incubators & accel.
There is a difference between the "born entrepreneur" and the "later in life entrepreneur". The first one is driven by curiosity and risk. It's good at building and maintaining relationships. The second one, has more experience in the field. They decide to become entrepreneurs after getting tired of the corporate world. They are getting younger and younger.	Is there any difference between Designer Entrepreneurs in each one of the two categories?	Designer Entrepreneurs Investors Business incubators & accel.

Inspiration comes from being curious, having the entrepreneurial mind-set, looking in different places than everyone else.	Designers are considered curious in general, does that help them to be entrepreneurial?	Designer Entrepreneurs Investors Business incubators & accel.
Creativity cannot be managed. Let creativity run wild. Don't set strict commercial metrics.	How do you know if there is progress in the overall product/business?	Designer Entrepreneurs Investors Business incubators & accel.
The only way to learn is by failure that makes you an expert.	What are the skills you need as a designer to learn from failure?	Designer Entrepreneurs Academic experts

Insights from Business Incubators and Accelerators.

Table 34. Insights from Business Incubators and Accelerators.

Insights from Business Incubators and Accelerators		
Insight	Questions to expand this insight	People to address this question
There are multiple authors with methodologies for goal settings, but they are addressing the same process.	Are these methodologies planned to be followed step by step?	Designer Entrepreneurs Academic experts
Nowadays is possible to have methodologies such as Agile and Sprints because it is possible to set up a company in few days and fly to Shenzhen (China) to develop things in a fraction of what it used to take before.	Is the speed the main advantage of these methodologies? What can designers learn from those methodologies?	Designer Entrepreneurs Investors Business incubators & accel.
People is educated in silos, but potentially, every discipline can bring up business people.	What can designers learn to encourage their business thinking? Is everyone a designer and they need to learn how to materialize tangibly their ideas?	Designer Entrepreneurs Investors Business incubators & accel. Academic experts
When the money, the technology, the creative capital and the will collide, innovation can emerge at staggering levels.	Why Shenzhen is so important in hardware? Why have the speed of development and quality increased in the last years?	Academic experts Investors Business Incubators and Accel.

There is the idea that today is cheaper to set up a company, but in reality, it is not. There is another cost involved, the cost moved from manufacturing to digital marketing and data analysis.	Is design considered an asset in a start-up? How can design reduce the cost of digital marketing and data analysis?	Designer Entrepreneurs Investors Business incubators & accel. Academic experts
China is more interconnected with the world, that allow everyone have access to their manufacturing power and speed of development	What is the implication for new product development and setting up a business? The advantages are clear, is there any disadvantages?	Designer Entrepreneurs Investors Business incubators & accel. Academic experts
Teams who are arrogant do not learn, they find difficult to pivot, because they are not listening to the feedback.	What is the fine line between having design leadership and listening to the users? How can you stick to your vision without any noise? Is that considered arrogance or clarity of vision?	Design entrepreneurs
Depending on the product life cycle, the product development strategy has to be tailored. Characteristic build for Early adopters might not be the same that for the majority of the market.	Is co-creation part of the product life cycle? When does the product development in the product life cycle stops?	Investors Business incubators and Accel. Design entrepreneurs
Timing improves with marketing knowledge and trend forecast.	What are the metrics that can help Designer Entrepreneurs to recognize the product life cycle?	Investors Business incubators and Accel. Design entrepreneurs
The best way to know where are you at in terms of your milestones are business intel. KPI's are key to	Are these metrics used by all the start-ups?	Investors Business incubators and Accel.

measure the timing of your company and your market. Customer acquisition cost is a KPI that tells you when to start growing or expanding or the market is slowing down.	Are these indicators part of the business acumen or something that every entrepreneur has to keep an eye out for?	Design entrepreneurs Entrepreneurs
Not all the innovation is gut feeling. Models of demand, orders of your product shares and likes etc., are small variables that can give you some guidance in the innovation process.		Investors Business incubators and Accel. Design entrepreneurs Entrepreneurs

Insights from Platforms and Events

Table 35. Insights from Platforms and Events.

Insights from Platforms and Events		
Insight	Questions to expand this insight	People to address this question
Getting government support for entrepreneurial initiatives can be a double edge sword. It can kill the resourcefulness of the entrepreneurs and the need to survive in a competitive environment.	What entrepreneurial stages can be subsidised or better supported by the government?	Investors Business incubators and Accel. Design entrepreneurs Entrepreneurs
The links between the "west" and China increased not only the demand of their manufacturing lines but also their business development and entrepreneurship.	Is there any other alternative for entrepreneurs if China is not the option? How can Designers get access into this international network of product development and manufacturing?	Investors Business incubators and Accel. Design entrepreneurs Entrepreneurs
The ecosystem has influenced the aspiration of industrial designers. Previously, designer's inventions could see the light through a manufacturing partner after licensing the product to it; or working their way up in a design studio that allows them to work on their ideas. Whereas now, it is easier to manufacture small batches of your product, test it and then getting the big manufactures or seed investment to grow big.	Are universities aware of these changes? How much impact can designers have in this ecosystem? Are designers (when everybody designs) becoming a pillar in this ecosystem? What are their capabilities and their limitations?	Investors Business incubators and Accel. Design entrepreneurs

To sell tangible things before making them real it is important to have a story behind the product and the company. The story builds empathy and trust. They have confidence that your company can deliver what has been promised.	How can Designers use their visual skills to make stories more compelling? Is there any evidence of how designers export the stories made to conceptualize into the marketing of the product? What elements do stories have to address in order to connect with people?	Designer Entrepreneurs Business Incubators & Accel Platforms
In a crowdfunding campaign, there are a number of micro stories that the team tell to keep informed their customers. This transparency can buy the team extra time to deliver the goods.	Are these micro stories related to the product or the team?	Investors Design entrepreneurs Non-Designer Entrepreneurs Business Incubators & Accel.
Kickstarter is essentially a story telling platform, you have a product that is just not about selling the thing, is inviting people into the story behind it, and include them into the process. Those become the early adopters, early users, they backed up the campaign	Are backers in Kickstarter a specific demographic? Keen on technology, innovation and trying out new things?	Investors Design entrepreneurs Non-Designer Entrepreneurs Business Incubators & Accel.
Inventors, makers, designers and entrepreneurs share their interest on building things and creating new objects. However, there vary on the purpose that had before building the product. Inventors stretch out the technical capabilities in their field, Makers like to try out new things for the first time, designers materialise	Can we say that the intersection between design and entrepreneurship is building something with a user/consumer in mind?	Academic experts

their concepts having a potential user in hand systematically and lastly, entrepreneurs build the platform and the product to reach a consumer.		
There is a fan culture around successful product/start-ups/entrepreneur.	Is that a hidden motivation that entrepreneurs have? Is that like sports fan encouraging their team to go the extra mile? Did you have fans who became your early adopters?	Design entrepreneurs Entrepreneurs Investors Business incubators and Accel.
Without the prototype it's impossible to tell the story, the story telling part, starts with the prototype, and then you can tell your initial vision, where is the product going, and how you envisioned it.	Without prototypes, how did companies sell their ideas before?	Design entrepreneurs Entrepreneurs Investors Business incubators and Accel.

Insights from Designer Entrepreneurs.

Table 36. Insights from Designer Entrepreneurs.

Insights from Designer Entrepreneurs		
Insight	Questions to expand this insight	People to address this question
Not only the tools and the platforms to develop a product/set up a company improved, also Investors have more sophisticated tools to back up their business decisions.	What do they need to see to back up a product start-up?	Design entrepreneurs Entrepreneurs Investors Business incubators and Accel.
In some cases, the entrepreneurial path started as a vehicle that allows the founders to experiment with the things they want, not as a source of money only.	Where testing out ideas more important than making profit out of them?	Design entrepreneurs Entrepreneurs Business incubators and Accel.
Product design is more refined, and the users/clients want to know more about the story of the product, the "Why". The story is the vehicle to create credibility. It is a more legitimate reason to get customers.	What is the role of stories in the adoption of innovative ideas? Why the start-ups need a story?	Investors Business incubators and Accel.
Focus in one product category as a start-up is the best to improve the performance in the start-up. Category buyers from large retailer's only focuses in one category, it is easy to address them.	Does that apply if the market place is digital? What strategy works better for radically innovative products?	Design entrepreneurs Entrepreneurs Investors Business incubators and Accel.
Big retailers might go bust because the market is not playing with the same rules. Amazon gives the	Are big brands shifting towards digital stores? What is the future of retail?	Investors Business incubators and Accel.

opportunity to compete against big brand retailers and also the reviews. Physical stores need to increase the customer experience to bring people in.	What are the consequences of going exclusively digital in the market place?	
Everyone has ideas of how to improve a product, but the risk is on how to select those ideas.	What is the best selection process for ideas? Are ideas worthless?	Investors Business incubators and Accel.
The difference between designers and entrepreneurs is the Conviction to take the idea through, from concept to production. Personal timing is very important (but this might apply to all the entrepreneurs).	Why are so many designers with great ideas and so fewer Designer Entrepreneurs?	Investors Business incubators and Accel. Academic experts Designer Entrepreneurs
Design entrepreneurs they normally they are quite sensitive people (not emotionally speaking), they see the markets, slightly different, and they pick up on the trends that other people might not see.	How do designers can map this information out in a report for investors? How do designers use this information to innovate?	Designers entrepreneurs Business incubators and Accel.
There is a side effect of over planning, it loses the spontaneity, and the excitement people know you for. Good ideas also happen "5 mins to midnight".	Does this spontaneity force novel approaches? When over planning a product, does that kills the creative mind-set? Does planning make designers to become more analytical and less pro-active?	Investors Business incubators and Accel. Academic experts Designer Entrepreneurs
Do not launch a product unless you are certain it has the DNA that you are known for	What are the elements of that DNA?	Design entrepreneurs

File a patent is the first step to escalate from product to business, it's also strategic before bringing more people inn. It is a repeated action among entrepreneurs. The other step is being ask for a formal invoice, then is when the free-lancer incorporates a start-up.	What is the most common reason why Designers start-up their company? What triggers them to become entrepreneurs?	Designer Entrepreneurs
The importance of participating in contest is crucial. They gave start-ups exposure, free press, mentorship, funds, product feedback, access to expertise and networking.	How can these contests be an opportunity to achieve milestones and focalize the creativity of the team? What are the side effects of participating in a contest for the business? What happens with the intellectual property?	Investors Business incubators and Accel. Academic experts Designer Entrepreneurs Entrepreneurs
Coming up with the idea is very different in each case. Scholar project, Serendipity, Market opportunity, etc. The importance is to know how to identify a good idea to start a business with.	What is the driver behind the idea? Does the entrepreneur have a record of inventions? Does the entrepreneur have a record of ventures?	Investors Business incubators and Accel. Academic experts Designer Entrepreneurs Entrepreneurs
Concept communication in the early stages doesn't need to be immaculate, it just has to be good enough to receive criticism.	What are the minimum requirements to pitch an idea to stakeholders? Is this criticism equally valuable from each stakeholder? How can you distinguish between valuable and invaluable feedback?	Investors Business incubators and Accel. Academic experts Designer Entrepreneurs Entrepreneurs

Complementary skillsets within the team are better to star-up a business but it's not compulsory	How do designers manage their conflict? How can designers manage talent?	Designer Entrepreneurs Entrepreneurs
Personal timing is crucial to start a business	Are there any similarities in the personal timing of the designer-entrepreneurs?	Designer Entrepreneurs
Entrepreneurs have to be good at building the product and the business at the same time	What is the advantage of having a designer in the founder team? What is the disadvantage? How dos that work in a team full of designers?	Designer Entrepreneurs Entrepreneurs
Delegate task but don't lose the track of the main objective. It is very important to keep the rest of the team informed about the overall process.	Is there any difference in the way designers communicate internally to the rest of the team?	Business incubators and Accel. Designer Entrepreneurs Entrepreneurs
There is always something to do, while you are waiting for the technology to be developed, you can develop the market or the community.	When do you know that you have to wait for the market to be ready? How do you know that? How do you know that the technology is not ready?	Investors Business incubators and Accel. Designer Entrepreneurs Entrepreneurs
Being a designer prepares you to constantly be looking into ways to improve the product. Transferring these skills into the business setting help you to recognize when things are not working as you planned and change direction or pivot the company.	Are designers willing to change their initial vision? Are they stubborn? How can you convince a designer that his/her idea is not the one the users want?	Investors Business incubators and Accel. Designer Entrepreneurs Entrepreneurs
A competitive environment within the team is perceived as healthy, especially when it comes down	How can internal competition stimulate designers' entrepreneurs?	Business incubators and Accel. Designer Entrepreneurs

to creative ideas. There is a sense of proud whenever designers put forward your ideas in the team. It is important to keep in mind the collective goal of the business.	Are there any drawbacks?	Entrepreneurs
To get confidence, it was important to receive criticism on an early stage. Criticism is seen as advantageous.	Who did they ask for criticism? Is that part of the benefits of contest?	Investors Business incubators and Accel. Designer Entrepreneurs Entrepreneurs
Industrial designers need an in deep knowledge in the manufacturing process, injection moulding and cost.	Is this part not covered in their majors or is it too specific for a start-up?	Academic experts Business incubators and Accel. Designer Entrepreneurs Entrepreneurs
The business plan is not fixed, and it needs to be considered as a process not as a "Set in stone document".	How flexible can the business plan be? Is breaking the plan part of pivoting? How does decision to follow or unfollow the plan are made? Based on quantitative analysis or qualitative analysis?	Business incubators and Accel. Designer Entrepreneurs Entrepreneurs Investors
Design schools in the UK are an off shoot of the arts schools. That placed them far away from business metrics.	Is there any benefit of this? Is there any positive side of it?	Business incubators and Accel. Designer Entrepreneurs Entrepreneurs

Insights from Non-Designer Entrepreneurs

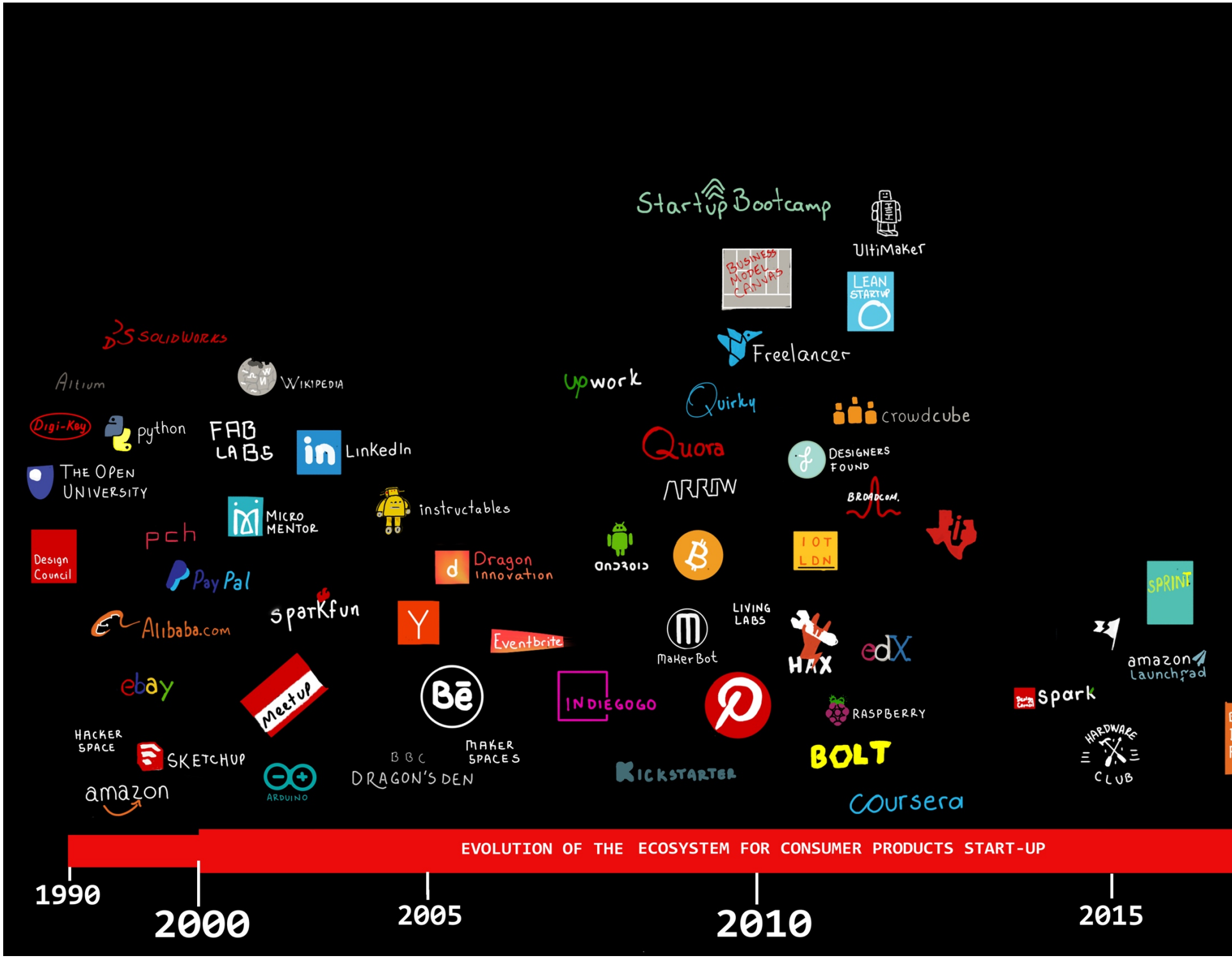
Table 37. Insights from Non-Designer Entrepreneurs.

Insights from Non-Designer Entrepreneurs		
Insight	Questions to expand this insight	People to address this question
The first thing after coming up with the idea is to search for is the size of the market and the business opportunity of it.	How can you measure the size of the market if it's a radical new product in a new market?	Investors Business incubators and Accel. Entrepreneurs
A business case goes before building the prototype.	How can you create a business plan if there is no previous information on manufacturing cost, size of the market, potential customer in a radical new product/market scenario?	Investors Business incubators and Accel. Entrepreneurs
Reduce risk by starting small batches of production.	Does this approach work for a technology push strategy or Market pull strategy? Does it work for a design driven innovation strategy?	Investors Business incubators and Accel. Entrepreneurs
The first step is to understand the market, the needs and the business case.	Does this only work for a market driven approach? Or tech push or design driven innovation?	Investors Business incubators and Accel. Entrepreneurs
There is no point of building a product without the demand of the market.	What if you need early feedback from users in a new product/new market scenario?	Investors Business incubators and Accel. Entrepreneurs Designer Entrepreneurs

A quick assessment of my skills and capabilities showed the need to ask for external help.	What is the advantage of outsourcing the designer's task? Are there any disadvantages?	Investors Business incubators and Accel. Entrepreneurs
You can outsource task where your skills are not in a good level, such as design.	How can you benefit from learning more about it?	Investors Business incubators and Accel. Entrepreneurs Academic experts
To get a loan, the business case is important. It assesses the risk and the potential of the market.	Does this only apply to the traditional source of funding? What about crowdfunding mechanisms	Investors Business incubators and Accel. Entrepreneurs
Pay for experts in the field, do not try to learn new areas, it might be much cheaper at the end.	Does that save money down the line?	Investors Business incubators and Accel. Entrepreneurs
The paradigm with this category is the Market pull model	Are the skills from marketers or business driven people good enough to transfer them into a tech push or design drive innovation type of business?	Investors Business incubators and Accel. Entrepreneurs
Consensus, panels or focus group can help to select the idea.	Is this democratic approach leading to disruptive innovation or continuous innovation?	Investors Business incubators and Accel. Entrepreneurs
Design doesn't play an important role in the company.	In this sort of company, what are the key activities?	Investors Business incubators and Accel. Entrepreneurs

The key activity is to set the pricing right and marketing related activities.	In case the plan is not right, what would you change?	Investors Business incubators and Accel. Entrepreneurs
The ideas can come from necessities and comparing existing products.	How can new products and new markets be created?	Investors Business incubators and Accel. Entrepreneurs
Founders need naivety, but the team needs experience to compensate that.	Why is so important? Otherwise?	Investors Business incubators and Accel. Entrepreneurs

Figure 117. Map of the research used as a prompt during the interviews.


Startup Bootcamp
UltiMaker
Business Model Canvas
Lean Startup
SOLIDWORKS
Freelancer
Altium
Wikipedia
upwork
Quirky
crowdcube
Digi-Key
python
FAB LABS
LinkedIn
Quora
Designers Found
The Open University
ARROW
Broadcom
Micro Mentor
instructables
pch
IOT LDN
Design Council
Dragon Innovation
PayPal
Sprint
Alibaba.com
sparkfun
Y
Living Labs
Eventbrite
MakerBot
HAX
edX
amazon launchpad
ebay
Meetup
Be
INDIEGOGO
Spark
Raspberry
Hacker Space
SketchUp
BBC
Maker Spaces
Dragon's Den
Kickstarter
BOLT
Hardware Club
amazon
Arduino
Coursera
EVOLUTION OF THE ECOSYSTEM FOR CONSUMER PRODUCTS START-UP
1990
2000
2005
2010
2015

Annex E – IN-DEPTH INTERVIEW (Outline)

Brief outline of the in-depth interview with Founder 1 – *Baby Sleep*

The following narrative build the events in a chronological manner, according to the entrepreneur story.

Background

Founder 1 is an industrial designer from the UK. He made his career in advertisement and in academia. Before setting up Baby Sleep, he was disillusion with academia due to the increase of administrative tasks and the lack of support in the college he was working at. He had not had any experiences in running a business before Baby Sleep.

Idea Generation

The idea of the product came up from his brothers-in-law. He was a newly dad with a newly born crying baby suffering from several weeks of sleeping deprivation. The only way he and his wife could make the baby fall asleep was to taking her out for a car ride. He noticed that the wriggle of the moving car calmed his baby down.

Idea pre-development

Potential branding

Founder 1 realized he could add value not only designing the product but also developing a brand around this product. They were not thinking about starting up a business, they were trying to come up with a product and then license it to a company.

Test of prototype

The first task they set out for were building a solid prototype that allow them integrate the electronic circuitry and case it. Using materials available at his workplace, Founder 1 designed the first case for the prototype. He was not making any money at all, but he was convinced it was a good idea.

Technology development

One of the cofounders holds a PhD in electronics and acoustics. He realized that the electronic part of the product can be improved by improving the electronics of the prototype.

Market research

Market Research

Meanwhile the technology of the product is being develop, founder 1 starts asking moms their opinion about sleeping deprivation. He starts collecting the opinion of the potential buyers of his product. They realized that it is a big unexplored market and it has a lot of potential.

Intellectual property / Legal advice

Once they realised the potential of the company, they decided to set up a company. Ask for legal advice and start the patent application.

Idea generation

After collecting the opinion of industry insiders, moms and dads they went back to the drawing room to add some features on the product. They decided that they need to go fast before someone else copy the idea.

Rapid prototyping

Once that all the features were stablished, they start prototyping the final version of the aesthetics of the product.

Accountant

Most of the operations within the company are covered by the founders of the company. They try to keep the overheads down by doing everything by themselves, except the tasks in areas which they do not know anything about. The areas are an accountancy, finance and Legal.

Early Validation

To validate the product, they enter to a product design competition to start building press and feeds for their social media.

Engineering Validation Test (EVT)

While the contest is still open, they finished with the circuitry and function of the final prototype. They validate the engineering of the product and are ready to identify factories in the UK or overseas.

Present the product and Diffusion

They won the industrial design contest that made them present the product for the first time, and start receiving attention from the local press.

Identify the factory

With the EVT in their hands, they started pondering the idea of Local manufacturing and overseas. Both of them have different advantages and disadvantages. They decide that the cheapest way to build it in an economy of scale is to fabricate the product in China.

Develop the Market

To avoid any risk, they decided to start raising awareness of the product. They started making some calls to potential retailers and checking international product fairs to find potential investors.

Contest

They won a major product design contest. The price was £250,000 pounds and mentorship from industry experts. That allowed them to keep the development of the idea and have the cash to start running the first test.

Mentorship

One of the mentors suggested some changes in the aesthetics of the product, arguing that the massage that the product deploys alienate part of the market.

Iteration

Before starting the manufacturing in China, the team had to work on the re-design of the product.
This was a difficult moment but it was the right timing.

Design Validation test

Once the team send over their layouts to China, they Design Validation Test suggested that everything fit inside the final design. The factory was ready to start manufacturing the product.

Channels

The team decided to start selling in the UK and in other Anglo-Saxon countries. Major retailers sing contracts with them to sell the products.

Sell

Once the first fringe was ready, they started accepting orders and distributing to retailers in the UK, New Zealand, Australia and Canada.

The Process – How you create your company / product. How was the process from idea to launch? I highly appreciate if you can give me as much details as you can, since the main body of information will come from this place for my research.

Multidiscipline – What decisions you have faced that involves more disciplines, and how you sort them out.

Reflections- what have you learnt about this journey and a piece of advice for future designers– entrepreneurs.

Annex F – STEPWISE REPLICATION

Name of Researcher: Jose Aldo Valencia Hernandez

Study Name:

DESIGN BASED ENTREPRENEURSHIP: The transition from designer to entrepreneur

Introduction

The study is investigating the transition that designers experienced when they set up a consumer product start-up.

This is a qualitative study where the selected research approach was Constructivist Grounded Theory. The study has ended, however, to secure the trustworthiness of the study, a post-investigation inquiry needs to be made. To ensure the consistency across the analysis process, you are required to read and comment on the extracts of the interviews along the codes presented by the principal investigator shown in the lines bellow.

Instructions

You are required to give your feedback on the coding and analysis phases of the study. A random selection of ten extracts of the interviews are presented and each extract have three questions that you need to answer. You are provided by a theme code to use as a proxy. Please read each segment of the text and provide your answers.

Please provide the following information:

Full Name: _____

Highest academic degree: _____ Area of specialization_____

Are you familiar with Grounded Theory: Y/N Date: _____

Signature: _____

CODE: WORK WITH YOUR GIVEN MEANS

"They had different ideas, my cofounders selected cardboard as the main material because one of them was working in a cardboard box company, one of them had lots of experience and also he had access to the material quite easily"

"They worked on that for few weeks, they didn't have to put any money, we had scrapped cardboard and the x-acto knifes from the factory, anyways, if we had to buy it ourselves, it would have been £20, so it was negligible"

Up to what extent you agree with the code and description?	0	1	2	3	4	5
	Strongly			Neither	Strongly	
What is missing?	disagree			agree nor disagree	agree	

What would you change?

CODE: WHAT ARE YOU WILLING TO LOSE

"It was a massive step. Many of my colleagues at school thought I was crazy to give up a secure and relatively well-paid career in teaching. I remember overhearing my line manager saying, -He'll never be able to successfully launch a new product. That comment has really driven me on in the last few years"

Up to what extent you agree with the code and description?	0	1	2	3	4	5
	Strongly			Neither	Strongly	
What is missing?	disagree			agree nor disagree	agree	

What would you change?

CODE: OPPORTUNITY MINDSET

"One night I asked my friend to join me, he´s a graphic designer interested in fashion editorial, it was ready to come with me the next morning".

"It was a very practical approach, I wanted to learn from the people doing things, we took the bus to Leon -a city well known for its vibrant footwear industry- and once we got there, asked people were the factories where".

"I had a vision of the product´s functions and looks, that helped me prototype it, even though it took me more than 100 iterations to get there".

Up to what extent you agree with the code and description?	0	1	2	3	4	5
	Strongly			Neither	Strongly	
What is missing?	disagree			agree nor disagree	agree	

What would you change?

CODE: FORM PARTNERSHIPS

"We made an agreement with the manufacturer owners to let us produce our shoes in their "free time". Three hours on Saturday and/ or Sunday"

Up to what extent you agree with the code and description?	0	1	2	3	4	5
	Strongly			Neither	Strongly	
What is missing?	disagree			agree nor disagree	agree	

What would you change?

CODE: HUMAN CENTRED FOCUS

"I had to start my final year and design a product from start to finish. I wanted to find the biggest challenge for city cyclists and tackle it, so about six months of that year was spent working with a ton of other cyclists, working with the driving psychologists working with the bus company in the council and being out on the roads myself… …once I did the deep dive I realized that actually, what was the real problem"

Up to what extent you agree with the code and description?	0	1	2	3	4	5
	Strongly			Neither	Strongly	
What is missing?	disagree			agree nor disagree	agree	

What would you change?

CODE: TRIAL AND ERROR

"At the beginning there were a lot of imperfections but the products were fully operational… After some months we realized that our clients shared some characteristics. They wanted to have something unique in their home or in their offices. More open to explore and without the concern of money"

Up to what extent you agree with the code and description?	0	1	2	3	4	5
	Strongly			Neither	Strongly	
What is missing?	disagree			agree nor disagree	agree	

What would you change?

CODE: SCARCITY

"We tried to save money, we did everything ourselves, we did everything by hand, but there was a point when we had to look for more efficient ways to make our products" F1.

Up to what extent you agree with the code and description?

What is missing?

What would you change?

0	1	2	3	4	5
Strongly disagree			Neither agree nor disagree	Strongly agree	

CODE: MAKE-DO

"I believe that a designer-entrepreneur has to adapt, it has to be very creative to utilize what it is available, and what can be done in time, budget and processes".

Up to what extent you agree with the code and description?

What is missing?

What would you change?

0	*1*	*2*	*3*
Strongly disagree		*Neither agree nor disagree*	

CODE: CONFIGURATION MINDSET

"It was a very practical approach, I wanted to learn from the people doing things, we took the bus to Leon -a city well known for its vibrant footwear industry- and once we got there, asked people were the factories were".

"I had a vision of the product´s functions and looks, that helped me prototype it, even though it took me more than 100 iterations to get there".

"There is no deadline, that´s why you can have loads of iterations".

"We did everything by ourselves for the first 18 months, from the packaging to the website until we realized it might be good idea to ask someone with expertise on the industry to give us some feedback".

Up to what extent you agree with the code and description?

0	1	2	3	4	5
Strongly disagree			Neither agree nor disagree	Strongly agree	

What is missing?

What would you change?

Code: ARTISAN MINDSET

“At the beginning I could work 12hrs straight, from my bedroom or at a coffee shop. I could design the whole day”

“I had all these creative thoughts, I felt inspired with every sketch, and every fabric I got my hand on. I was hungry to learn more”

“I could watch tutorials all day long and the next day try new techniques out”

“I loved tinkering with this new cool tech I have in my hands. I knew this was going to be ground-breaking”

Up to what extent you agree with the code and description?

0	1	2	3	4	5
Strongly disagree			Neither agree nor disagree	Strongly agree	

What is missing?

What would you change?

Code book

WORK WITH GIVEN MEANS

Who am I? What do I know? And whom do I know? Are questions that the entrepreneur uses to imagine possibilities that come from their given means?

WHAT AM I WILLING TO LOSE?

It refers to the simple question: What can I afford to lose if I do this? Experienced entrepreneurs understand what they can lose instead of looking for a large profit or all-or-nothing opportunities.

SCARCITY

Scarcity of resources allows entrepreneurs to focalize thier creativity and find multiple ways to overcome difficulties

MAKING DO

It refers to the ability of the entrepreneur to come up with a solution to tackle the challenge utilizing whatever is at hand.

ARTISAN MINDSET

The artisan mindset is a stage where most of the participants started at. They concentrated their time and effort in perfecting their craft and skills. They find meaning and satisfaction in the process, and enjoyed fiddling with the materials, forms, pieces and devices.

CONFIGURATION MINDSET

The creativity unleashed in the previous mindset loses subjectivity when Designer Entrepreneurs concentrate on one single object, this creates the ground bed to start thinking about the company. In order to configure the product, they bring friends and family on board. There is a constant learning on how design informs the rest of the team and how other areas of the start-up influence the product development.

OPPORTUNITY MINDSET

There is a realization that their main goal is to keep the business alive and make it grow. The main concerns are sales and distribution channels, make strategic alliances with suppliers and manufacturers and mentorship. There is a better understanding of the gatekeepers in the business. There is a constant lookout for potential sources of funds, mentorship, recognition, validation and diffusion. Their role shift towards the sales, gaining speed and improve the cost/price ratio.

TRIAL AND ERROR

The initial hypothesis has to be tested over and over again until a satisfactory result comes out of the process. They are not considered errors, but the approach can be seen as a “trial and error”, this allows designer to find the most successful way to deliver the value to the customer.

FORM PARTNERSHIPS

This effectual principle refers to the ability of entrepreneurs to see other companies competing on the same market as allies. This is, they find the way to complement their business proposition helping or forming partnerships with their “adversaries”.

HUMAN CENTRED FOCUS

Human centred design is a problem-solving methodology where the emphasis is on iterated observation of the human actions and behaviours and his/her interaction with the contest, followed by an iteration phase where trial and error help to refine the prototype and finally testing the idea with the user to validate the product or service

Annex G – PUBLICATIONS AND AWARDS

By Jose Aldo Valencia Hernandez and Alison Pearce

The skills and talents of a design professional are not necessarily the skills and talents that will help them succeed with a startup business. Many "entrepreneur designers" could do with some help from professionals who can help them see the "big picture."

Notes on Designer Entrepreneurs and "The GEP

ENTREPRENEURSHIP AND INNOVATION ARE closely related. No matter the size of the company or the stage of its development, to close the gap from invention to innovation requires an entrepreneurial effort. Entrepreneurship is a way of management; it can manifest itself as a startup or a spinoff. Even big companies work to stimulate entrepreneurial action in their employees to foster innovation inside their organizations. This is known as "strategic entrepreneurship," a term first coined by Stanford University's Robert Burgelman.

Product-based startups have a unique opportunity to thrive due to the conditions influenced by new technologies in recent years. This new ecosystem allows them to accelerate the process of getting an idea to market. Product designers are well integrated in this ecosystem. Designers manage their startups by tapping into a design approach to create value, shaping new ways of looking at traditional management and business practices.

This article reports on the experiences and opinions of more than 30 participants in the consumer product startup ecosystem, including designer entrepreneurs, non-designer entrepreneurs, investors and venture capitalists, heads of crowdsourcing platforms, directors of business incubators, accelerators and startups, and leading academics in the fields of design and business. We documented the entrepreneurial path, decisions, challenges, and interactions with other members of the ecosystem to draw a clear picture of the role of the designer entrepreneur. This is ongoing research, so the names of the participants have been anonymized. Our work is undertaken under the auspices of Global Entrepreneurial Talent Management 3 (also known as GETM3), an EU-funded international,

PETTO Effect"

interdisciplinary research and innovation staff exchange project. Its overarching aim is to improve employability and future global talent management to support economic development.

To begin with...

When we started researching designer entrepreneurs in the consumer product sector, it became clear that these products needed to have a market and appeal to customers. They had to be able to be mass-produced rather than "bespoke artifacts" that resemble crafts made for a few.

Initially, we needed to understand the startups' challenges in reaching the market. After studying academic research and observing the workings of business consultancies, we decided to construct a map (Figure 1, next page) of the reasons why startups might fail. We classified those reasons into six types: product, user, corporate, team, personal, and market. Then we broke them down even further to study which of them a designer could address and solve. For example, it is common to start the design process with users in mind, asking for their feedback in the early stages. This can tackle problems like "ignores the customer," "user-unfriendly product," "offering nice-to-have but not essential value," and "pleases investors but not customers." Designers might require additional help to face the challenges depicted on the right-hand side and lower section of the map.

Of course, having a designer in the driver's seat doesn't guarantee product success either. Perhaps consumer attention spans are shortening, or competition is too intense. Consider that startups struggle to gain not only market share but also mind share. And obviously, it is difficult to come up with something that captivates or even catches the attention of customers. Product saturation is a

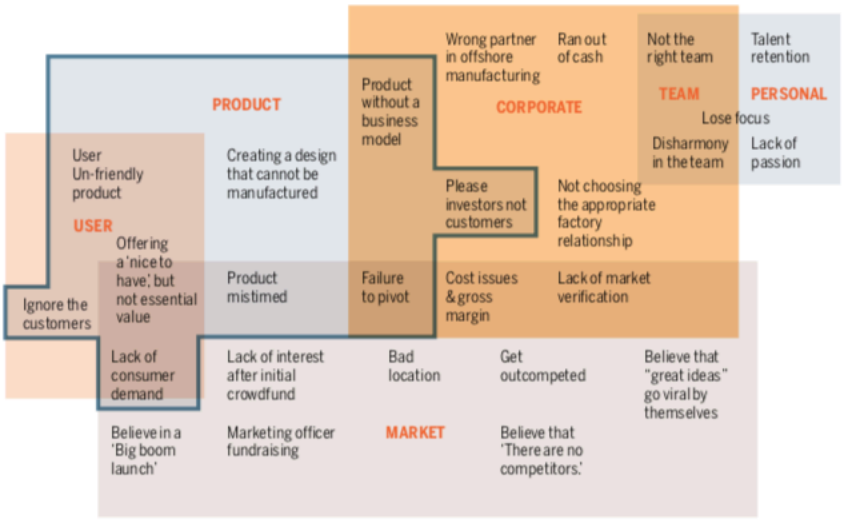


FIGURE 1
Map of reasons why startups fail. Designers are most likely to tackle the challenges within the blue perimeter. The challenges depicted on the right-hand side and lower section of the map might require help from other sources.

Valencia, 2019; Northumbria University, School of Design.
Based on: Dragon innovation, 2018; CBinsights, 2018; Jonikas, 2017; CBinsights, 2016; Ritholtz, 2012; Weck et al, 2007

given, and clever advertising, beautiful packaging, or amazing features are not a guarantee of success—because most users take those attributes for granted.

Is the ecosystem influencing designers?

The personal traits of the entrepreneur are not the only things that influence the performance and results of startups.

For example, there is the matter of the ecosystem in which designer entrepreneurs set up their startups. Figure 2—our ecosystem—illustrates a small sample of the platforms, services, software, and communities to which a UK-based entrepreneur in a consumer-product startup has access. This ecosystem includes investors, business accelerators, crowdfunding, social media and events platforms, prototyping tools, product development software, massive open online courses, startup methodologies, online marketplaces, distributors, offshoring companies, design organizations, and manufacturing companies. Some of these are available worldwide and others locally. In the past, this ecosystem was still in its infancy, not very well connected among industries and still finding its role in the game. Now, with the help of social media, entrepreneurs can run queries, access networks of potential customers, and receive feedback about their product in real time. Online retailers allow entrepreneurs to sell their products across the world without the need for big inventory warehouses. Open hardware and software platforms have reduced the complexity involved in building devices. Additive manufacturing speeds up the prototyping stage, and crowdfunding provides a faster user validation, not to mention access to seed capital. The costs of tooling and manufacturing have decreased considerably. On top of that, specialized e-commerce platforms allow

FIGURE 2
A brief sample of the ecosystem for a product-based startup in the UK.

businesses to contact a remote manufacturing base faster than ever before.

Early findings and insights

We conducted some initial analysis of the data collected from 11 successful UK-based designer entrepreneurs, asking them about the way they started their companies and how they manage them now. Essentially we asked for their personal journeys from designer to entrepreneur. From this we can draw some preliminary conclusions.

The designer entrepreneurs we interviewed had no business training. None of them knew how to set up a company. They did not come up with their business idea based on market research, potential profit, or availability of technology, and none of them studied people's needs in order to conceptualize their products. They decided to start their businesses after focusing on their own needs and aspirations, actively mining their personal experiences and previous projects to come up with the product.

This immediately sounds contradictory to suggestions of "have the user in mind" and "receive feedback from early stages." Entrepreneurs working on a new product in a new market generally don't have enough data to make informed decisions. This is where a designer's prototyping ability can help them to run small tests and experiments, generating useful information on which to base decisions.

In some cases, product contests and design competitions gave our designer entrepreneurs the external validation that reinforced their initial ideas of starting a business. Such contests turned out to be crucial because they helped attract the necessary media attention. Our subjects also received feedback from industry insiders and the community that later on became their first testers. Contests and competitions attract possible mentors and the required funding. Entering competitions was a self-serving process, but effective, in that it gave them

Notes

1. S.D. Sarasvathy, "Causation and Effectuation: Toward a Theoretical Shift from Economic Inevitability to Entrepreneurial Contingency," The Academy of Management Review, vol. 26, no. 2 (2001), pp. 243-263.

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a clear understanding of possible problems and instant feedback on how to solve them.

The craft behind the product development

All of the entrepreneurs in this study designed something that could affect their own lives, regardless of how many potential users they could reach. They used their apparent "lack of resources" (time, money, access to tools, and network) as an asset to focus their creativity into a single idea. The resources available in the ecosystem made a big difference. None of these products could have happened ten years ago when the entrepreneurial ecosystem had not enough resources to offer, and it was less open to designers.

We must note that these entrepreneurs did not reach out to potential users and customers until after they had built their first prototypes. That let them clarify their proposal, and build on it. They asked for feedback on how to improve the prototypes they had already made, rather than asking for initial ideas. The business model in most cases evolved once the designer entrepreneurs had clarified product features.

The "Geppetto Effect"

All of our participants had a book, a diary, or a digital backup of ideas they wanted to develop. In some cases, there were years' worth of sketches and concepts waiting to see the light.

In six of our participants, we spotted a peculiar pattern: an idea that "spoke" to them, a concept that transcended the product dimension and encouraged them to take it to the next level. These designers spent so many hours crafting their solutions that part of their own identities was transmitted to the objects they designed. From IoT items to medical devices, from baby products to kitchenware, designers used information that came from within themselves (experiences, perceptions, values, and anti-values) to shape, one by one, the characteristics of the product. Each decision taken was thoughtfully considered to find coherence between the product and the designer's own vision and intent. In effect, this was an inside-out process, since these designers created items that were meaningful to themselves. We call this the "Geppetto Effect," after the impoverished woodcarver who made the puppet Pinocchio in Carlo Collodi's famous fantasy adventure. It features a master carpenter who was given a special block of wood to work with—a block of wood that spoke to him—whereupon he carved it into a boy.

By the "Geppetto Effect," we mean the search for perfect craftsmanship that becomes a double-edged sword, because it focuses on the excellence of execution of a product rather than the development of the company formed to market that product. It was an approach that all of the entrepreneurs admitted increased the time and expense of product development and business setup. Essentially, their attention to detail and the determination to stick to their vision worked against them in establishing a commercial enterprise.

At the same time, there were some advantages. This identity-giving process reinforced the story behind the product—a story that became very useful in inspiring sales. Crowdfunding sites supported these companies even when they didn't yet have a fully operational product—because of the stories.

Backers were looking at the product through a human as well as a business lens. They enjoyed supporting it because that struggle resonated with their lives, values, and experiences. Certainly, a product's story and identity can influence public perception.

Entrepreneurs are pragmatic; designers are synthetic

Cognitive scientists have developed multiple theories to explain the logic of entrepreneurs. In 2001, Sarasvathy[1] hypothesized that entrepreneurs tend to operate by either causal logic or effectual logic. Causal logic describes building up a prototype once the business plan has identified an opportunity. This logic seeks to minimize risk and unexpected situations by planning every step

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and sticking to it. Starting up a company thus follows a step-by-step procedure. It's an approach that works when enough information is available, the environment is stable or predictable, and the company can proceed by innovating incrementally.

Effectual logic is more explorative. Here, the business plan is developed once the product has contributed to create the opportunity. Trial and error work under this logic. For us, this approach might work well when a new product is targeted at a new market, and not enough information is available to calculate the business goals involved. This approach works better in a turbulent, complex, or fast-changing environment where a "muddling-through" strategy might be effective.

Our participants with a business background started their product development after sizing up the market opportunity and creating a solid business case. Designer entrepreneurs tended to fall into the "effectual" camp —developing the solution before working on a business model. Their market and technology acumen was minimal, resulting in a naïve approach to business. However, their product acumen did provide them with a robust approach to achieving a desirable product.

Having survived their first launched product, they then learned how to create and use business metrics to measure their performance and evaluate their innovation strategy, despite their lack of formal business training.

Talent management

Although universities are delivering more skillful and talented design professionals, they are not training them to work for a startup or to start a business themselves. This generally involves tasks that are ill-defined, and it may require the ability to communicate with different disciplines and learn from them quickly. It's difficult for designer entrepreneurs to learn to manage new talent with ill-defined job descriptions.

Early insights show that designer entrepreneurs work better with professionals who can see the "big picture" of startup, product, and context. The best fit comes with individuals who are capable of seeing clearly how their skills can contribute to that complete picture. Designers generally don't wait to gather vast amounts of information in order to predict the future. Instead, they learn to control the variables at hand, working with their available resources and shaping what they believe is compelling in their vision of the future. Communicating their preferred scenarios to the rest of the team, designers tend to use visual aids. Some even produce videos to align the team with their vision. As one said: "Let them run wild—but make sure they share the same vision."

So, what's next?

The entrepreneurial process consists of intertwined activities: One thread is the product idea and its development, and the other thread is the business setup. In studying this issue, it's difficult to disentangle these threads because they toggle back and forth iteratively: Some product decisions affect the business, and vice versa. We are currently working on identifying milestones that can be used as a system of references to compare different participants and draw conclusions. We are also planning to conduct a longitudinal study to follow the decisions taken by design entrepreneurs. Through the opportunities afforded by working on a major international project and the transnational mobility it funds, we hope to broaden and extend the reach of our research with a view to recommending ultimately how business and design schools can collaborate to produce successful designer-entrepreneurs. ■

Acknowledgement
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Existing in the wild: designer-entrepreneurs moving from invention to innovation via an advantage-seeking mindset - a brief discussion of concepts.

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Abstract

Entrepreneurially talented people inside organisations know how to navigate adversity, to leverage the elements of their ecosystem in order to make things happen, and how effectively to utilize the given means to drive change. In a new venture these characteristics are crucial to thrive. Start-ups rely on their talent to adapt to constant change and unstable situations.
This paper describes two concepts in how design talent becomes entrepreneurial, through 'cognitive harmony' and 'cognitive dissonance'. Designer entrepreneurs navigate from the design to the business discipline, adapting business theory and practice in a different sequence. Designers are known for their creative skills, which help them to realise products and services in a desirable, viable and feasible way. They increase revenue in companies in a two-to-one ratio, but they also impact other areas of the organisation, such as culture, customer experience and brand value. This paper discusses these ideas and proposes developments of the 'opportunity-seeking mindset' more accurately describing the designer-entrepreneur. We propose that designers can be considered talent in any organisation due to their contribution to business goals.

1. Introduction

Makers, inventors and innovators have a hands-on attitude towards building and realising their ideas. However, they serve different purposes. On one hand, makers like building things they find interesting with the available technology, integrating them for the sake of exploring their technical capabilities. Inventors stretch out their technical capabilities to discover new boundaries in processes, objects or technologies. Innovators improve, change or create new products out of objects, processes or technologies aiming to compete with, or to differentiate themselves, from other offers. They consider the impact they can have (economic or social). Steve Jobs, the founder of Apple inc, indicated in 2011 [1] that Apple was organised as a start-up. This meant that there were no committees: every person was empowered to deliver value and responsible for a specific task. They operated through ideas not hierarchy. The key to retaining the best talent was to let them take decisions and bring their ideas to the table. In this case, Jobs referred to innovative traits in the talent Apple was recruiting. That lead them to become open to entrepreneurial behaviour, in order to retain the best talent.

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2. Designers managing start-ups

Management studies have overlooked designers' ability to manage new ventures. Designers and entrepreneurs share some personal and professional characteristics that make them suited to developing new products and managing new venture creation. However, there are no studies reporting how they changed their mindset from being only designers to transform themselves into entrepreneurs or which characteristics differentiate non-designers from designer entrepreneurs.

Designers make sense of complex data about the product trends, user needs, and latest technology to build their products. However, when it comes down to business decisions, their tools are not limited to product development. They provide rich information to generate meaningful experiences to their customers and to form a business model.

On the other hand, entrepreneurs connect products or services with the market, seeking to generate profit. Their business knowledge can be empirical and specific. They are not limited to meeting business goals however. Entrepreneurs apply business acumen such as metrics and strategies to make decisions related to the product. If we consider start-ups as hypothesis testing machines, designers and entrepreneurs are the scientist behind the experiments, picking up any subtle signal that can lead to business growth. However, they follow different methods to experiment, test and learn about the business. In this paper, we explore the mindset behind designer entrepreneurs and show evidence of how they benefit from this dual role inside product start-ups.

2.2. Designers: entrepreneurs or freelancers?

Designers are known for their creative skills, which help them to realise products and services in a desirable, viable and feasible way. They increase the revenue in companies, almost in a two to one ratio [2] but they also impact in other areas of the organisation, such as culture, customer experience and brand value, to name a few. In this study we infer that designers can be considered talent in any organisation by their contribution to the business goals. Designers are also recognized as natural entrepreneurs, due to their competences in the idea-generation and product development processes [3]. There is an interplay between the talent and the type of business they create. As Bianchi mentioned in 2009 [4], talent and wealth are the decisive factors in becoming an entrepreneur or self-employed.

One example is the founder of a consultancy design firm based in London. She commented that the transition from being a freelancer to becoming an entrepreneur happens in a short time. In her case, she worked as a freelancer for several years, but as the calibre of clients improved, their requirements grew. A client request for an invoice was the minor event that triggered the need to incorporate a studio, look for a name, find a physical address and consider hiring more people. At that moment she labelled herself an entrepreneur. There was no complexity in doing it, but it was clear that now she was representing a brand and the identity of her company.

2.3. The core overlaps

Generally speaking, designers and entrepreneurs speculate about the future by integrating complex information, ranging

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from human-centred insights, state of the art technology and socio-cultural changes into a product or a service. They imagine how, when who and why people would use their product or service. They form scenarios representing different time horizons that are event-dependent; This is, they can change depending on the situations, leveraging the incoming circumstances. Both profiles are considered creative. By definition, the main difference is that the one that focus on the execution of the object or service is considered the inventor, whereas the one focused on the implementation of the "solution" with the real market is consider the innovator.

Entrepreneurs seek favourable circumstances in which to launch their products: timing, technology readiness, market maturity and funding can interplay to make things happen. This is called the 'opportunity seeking mindset' [5]. On the other hand, the mindset of a designer is arranging tangible and intangible characteristics to form a coherent proposition perceived as desirable, viable and feasible. This can be called a 'configuration-seeking mindset'.

But there is a midpoint between these two positions that can help describe designers moving towards business and business people interested in design. It can be assumed that a combined profile between designer and entrepreneur can be a favourable position when it is time to invent and innovate. This profile occupies a strategic position that understands the users' needs and how to make things happen to reach the market. This profile can leverage their skills to speed up the iterations needed to make people want and pay the product. We call this the 'advantage-seeking mindset'.

3. The mindset of the designer-entrepreneur

What does it take for a designer to become an entrepreneur and what should they learn in order to excel in a business setting? There is no definitive way to combine these 'opportunity-seeking' and 'configuration-seeking' profiles. Formal business education does not offer a suitable 'major' as it is still a crossbreed of disciplines. Designer entrepreneurs happen to exist 'in the wild': they learned the hard way the nuances that design and business can add to the entrepreneurial path.

3.1. Cognitive harmony and dissonance

Fig. 1 below shows a map of the creative process from idea generation to implementation based on Charles Owen's work [6]. This schematic consists of 2 axes. The horizontal axis represents two poles, the analytical and synthetic cognitive poles. The vertical axis is formed by the symbolic and real realms of activity. At the very early stage of the product/start-up, where the solution is still vaguely configured and the business yet to be defined, inventors (in this case engineers and product designers) are realising their ideas without thinking of a particular market. These actions bring the inventors towards the quadrant where synthetic and real thinking happens. Innovation must be perceived as an integral solution, pointing out that product innovation lies at the bottom right of the diagram. This flow of thinking represents a line that is coherent between product development and the start-up setup.

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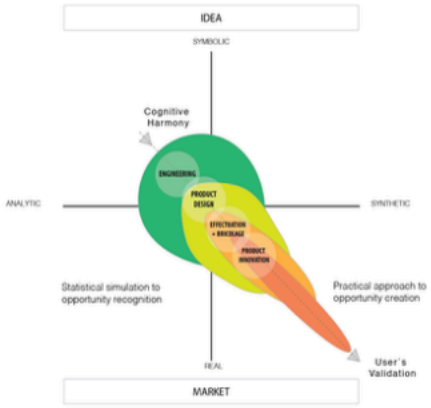
Figure 1: Cognitive dissonance (schematic by the authors, based on Owen, 2007).

Figure 2: Cognitive harmony (schematic by the authors, based in Owen, 2007).



In this quadrant, the first loops of feedback refine the proposed solution as well as the business idea. Cases like Airbnb and Dyson show clearly this way of thinking from their founders. Airbnb started with an idea, then they prototyped it to have their first customers. That in turn provided feedback to improve the platform. But when an analytical approach to business is taken, this coherence is broken. In Figure 2, also based on the work of Owen [6], interruption to the flow can be seen.

The left-hand quadrants are more involved in discovery (finding) and those on the right in invention (making). A symbolic/real vertical axis divides the map, according to content or realm of activity. Upper quadrants show an abstract, symbolic world and the institutions, policies and language tools that enable people to manipulate information, communicate and live together. Lower quadrants map the real world - artefacts and systems necessary for managing the physical environment.

Start-ups working in consumer products realise solutions by integrating technology into devices that will be used, operated or handled by a human being. The problem emerges when, instead of gaining traction by testing such ideas with potential customers to gain progress and speed, the founders have to put aside the developing process to learn business and management skills. Business planning, building cost structures, forecasting revenue models and staff management can undermine the hands-on attitude of product entrepreneurs at a very early stage This creates mental discomfort through performing actions that contradict their natural procedures, and confronting them with new processes and information. In psychology this phenomenon is named cognitive dissonance [7]. Cognitive dissonance is described by Harmon-Jones & Harmon-Jones [8]as follows: *"when individual holds two or more elements of knowledge that are relevant to each other but inconsistent with one another, a state of discomfort is created. This unpleasant state is referred to as dissonance".*

Designers in consumer end products need a practical way to start up a business: a

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way in which they are able to get closer to a tangible solution faster, to be marketable and produce something for which customers are willing to pay. Bricolage [9] and effectuation, instead of asking for detailed analysis, focus on a set of principles aimed at always making progress. What is available determines the outcome, and the scarcity of the environment focuses creativity. Inside a corporation, the gap between the prototype and product innovation can be filled by Burgelman's 'autonomous strategic behaviour' [10] which he calls *"the motor of corporate entrepreneurship"* (p.241). 'Autonomous' is as opposed to 'induced' strategic behaviour i.e. that directed and managed through the strategy. So influential are the autonomous initiatives of 'strategic entrepreneurs', when successful, that Burgelman [11] proposes that *"strategy follows autonomous strategic behaviour"* (p.62), which is a possibility [12] under an 'umbrella strategy' [13].

Business schools have traditionally focused on analytical tools and methods to bridge the distance between an initial idea and getting to market. But analysis usually relies on understanding what has gone before, and when a new path does not easily relate to previous experience, as in the case of discontinuous innovation, there is no reliable process or method.

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Entrepreneurial talent management in designer led start-ups.

"Why is it every time I ask for a pair of hands, they come with a brain attached?"

Henry Ford (1863- 1947)

Companies funded by designers such as Pinterest, Kickstarter and Airbnb are considered game changers. From image sorting to private accommodation, these entrepreneurs used their design approach to create disruptive businesses. They have shown that design can be used for more than designing the end product. It can be used to shape the culture and the vision of the company, enter into new markets and communicate with the stakeholders challenging and new concepts. Entrepreneurship is a way of management; it can be displayed as a start-up, spin-off or spin-out. Even big companies are looking to stimulate entrepreneurial actions in their employees to foster innovation inside their organisation. Designer-entrepreneurs are shaping this new way to look at management; this is how designers take the role of entrepreneurs, tapping into the traditional management and business practices adding the design approach to it.

The following reflection comes after interviewing designer entrepreneurs in the UK; I can point out some of the most valuable skills and knowledge that made the difference when they decided to run their start-up.

Visual thinking and ***visual communication*** are something that characterises designers in every organisation. These skills are located at the technical level. They allowed them to communicate visually, complex ideas to the entire team and stakeholders, evading disharmony of vision or goals in the organisation.

At the personal level, the most recurrent skills showed were ***resilience*** and ***patience***. They facilitated designer-entrepreneurs to embrace failure and use it as a source of knowledge in unpredictable environments (as the nature of the start-ups is highly innovative).

Highly innovative start-ups struggle to attract, hire, train and keep highly specialized talent since the universities outflow has not been enough to fulfil the demand. They are facing a big issue: ***How can universities be prepared for jobs that have not been created yet?*** And at the same time, ***how can start-ups manage these new characteristics?***

Designers shed some light on this dilemma. They can work with *ill-defined problems*.

Designer-entrepreneurs did not wait to gather plenty of information to predict the future, they somewhat ***controlled the variables at hand***, ***working with their given means*** and started shaping what they believed it was compelling to their vision of future.

They focused on **progression, not perfection**, they can **make do** and **leverage the circumstances** based on their flexible mindset instead of waiting to have the perfect plan, and all the resources sorted.

Design Management has reached a level of sophistication in big enterprises and SME´s. It needs to focus more attention to the way of **how start-ups led by designers are re-shaping the face of management.**

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Exploring the role of design-as-strategy in consumer product start-ups

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Pinterest, Kickstarter and Airbnb are recognised as high-profile tech-sector unicorns (start-ups with $1bn valuations) and all had designers in their core founding teams. This illustrates the potential value of Design Approaches in entrepreneurship practice but raises the question: what does a design-based perspective add to contemporary modes of entrepreneurship?

This study presents a review of the literature on contemporary models of entrepreneurship and considers it in relation to the literature on design approaches. The paper focuses on consumer product start-ups in particular, where new technologies, services and supply-chains are accelerating the journey from idea to market. There is little academic literature about the role for design to provide entrepreneurial leadership in this context, and yet entrepreneurship studies show that a poor fit, between the product offered and what customers really value, continues to be a primary factor in why start-ups fail. From the disciplinary perspective, design should be well positioned to help business start-ups circumnavigate such pitfalls. The paper concludes by proposing a preliminary framework, which models recent theories of entrepreneurship and the prevailing theories of design. The value of the framework is that it characterises the Design Approach, finding both parallels and distinctiveness in relation to other models of entrepreneurship. As such, it has the potential to assist the correlation of theory and practice, leading to an improved understanding of the paths to successful entrepreneurship.

***Keywords**: designer-entrepreneur; design entrepreneurship; innovation; start-up; design-as-strategy.*

Introduction

Organizations are increasingly operating in crowded markets, relying on innovation to respond to changing trends in consumption. This requirement for new product and service innovation creates opportunities for inventors, designers, and entrepreneurs across multiple sectors. Once, the first responders to these innovation opportunities were business entrepreneurs, but now we see an increasing prevalence of designers as founders and co-founders of new start-ups – the *design entrepreneurs.* However, there has not been an extensive study of this shift, specifically its alignment with literature and theory.

A creative world is arising, according to Bakhshi (2015), the creative workforce is likely to continue to grow, due to the resistance that creative occupations have towards the automation of labour; 87% of creative workers in the UK are at low or no risk of being displaced in this way.

Based on Gross Domestic Product, the UK has one of the largest *Creative Industries* sectors in the world (CBI, 2015). Design is one of the main pillars of the creative economy, contributing £72 billion to the UK economy, making up 7.2% of total Gross Value Added and employing about 1.6 million designers (Design Council, 2015). According to the Design Council (2012), jobs in the U.K, within the creative sector are growing more than five times faster than in the economy as a whole. Individual creativity, skill, and talent have a potential for wealth and job creation through the generation and exploitation of intellectual property, these activities are described by the UK government as the Creative Industries sector (UK Government, 2001). The nation's creative industries now employ almost two million people (UK Government, 2017), The United Nations' report on the creative economy introduced the term "creative industries" in 2008, as industries involving the creation, production, or distribution of goods and services that use creativity and intellectual capital as their primary input (UNCTAD, 2008).

The ecosystem of new product development start-ups in consumer product markets.

In the consumer product sector, the costs of bringing new mass-produced products to market have been prohibitive. In particular, the investment in the later phases of product development, where detailed design using CAD, prototyping several iterations with multiple components, and commissioning moulding tools, have created high up-front costs. This has led to a dominance

of established firms as the organisations large enough to manage the financial outlay and risks of such development. However, in less than a decade, technological breakthroughs have been shaping the face of new product development, allowing start-ups in the consumer product sector to gain speed and traction faster than ever before.

The democratisation of information, the dropping costs of technology, and the penetration of internet access and social media, have created a global arena where unexpected entrepreneurs can emerge in any part of the world.

New trends in the way societies innovate are emerging. The maker movement (Hatch, 2014) enables more product design experimentation at a relatively low cost using open hardware technologies (such as Arduino and raspberry pi), 3D Printing, 3D CNC, laser cutting and microelectromechanical systems sensors.

According to Eleaver (2015), the following are significant trends that have changed how new product development occurs, making it faster, cheaper and more accessible to a broader population. The falling prices of prototyping increase the speed of iteration and proof of concept. Products like *MakerBot*, *Cubify*, and *Ultimaker* have a deep market-penetration among inventors, enabling them to test their ideas faster. Also, there is greater access to international suppliers through companies like *Alibaba.com* to source a wide-range of components and to commission part-manufacture at a relatively low cost. Additionally, the funding mechanisms have changed. Crowdsourcing platforms are pushing forward the methods of financing and seed capital. Companies such as *Indiegogo* and *Kickstarter* can be used to serve two critical purposes in the development stage of a start-up. They are used to bring some funds to the company and also provide the validation needed for the product. Price setting, demographics and the possible size of the market can be defined with the information provided by these sorts of platforms. Companies like *Crowdcube* go one step further, allowing regular people to invest in upcoming companies, bringing cash to the start-ups in exchange for equity.

Decentralised distribution channels break down the barriers and cost of traditional physical retail, allowing start-ups to showcase their products without any intermediaries or minimum orders. Companies like *Amazon* also handle the logistics behind the distribution of the products, making the structure of start-ups leaner.

International transaction platforms such as *PayPal* allow regular people to pay, send money, and accept payments all over the world. Start-ups are

tapping into these platforms to hire offshore employees to help them out in specific technical tasks of research and development projects, dropping the cost of an in-house professional, and once again making the structure of the start-up leaner and speeding up the development process.

Makerspaces, hackerspaces and Fab-labs offer their users access to specialised machinery to speed up the process of prototyping, creating hubs as a by-product, where the creative class can meet up and share information and experiences (Forest, 2014).

In the case of the United Kingdom, as a result of these technological improvements, more business incubators, start-up programs and funds focused on new product development in consumer products are arising (The *British Design Fund, The Design Council´s Spark* programme and *The Brunel Central Research Laboratory*).

These organisations provide expertise in business, intellectual property, manufacturing, technology and marketing to help entrepreneurs shape business opportunities in consumer end products. It is evident that a wide array of new support functions has emerged for entrepreneurs, however, sustainable businesses don't always result and there is still a high attrition rate for new start-ups.

Design entrepreneurship

Design entrepreneurship is about producing and marketing the intellectual properties of a viable concept in terms of assuming risks, financing and management responsibility (Gunes, 2012). Start-ups are temporary organisations founded by entrepreneurs who are looking for a scalable, repeatable and profitable business model (Blank and Dorf, 2014). NEA (2016) published a study about the future of design in start-ups, where 85% of companies have founders or chief executives that weigh-in on design decisions. The DMI (2016) studied a portfolio of 16 publicly traded stocks from companies considered to have a design-centric strategy. They found that design-centric companies outperformed the US's top 500 companies by 211% It is expected that the results would be even better for start-ups embracing a design-centric approach at the outset (Petersen, 2015).

Recent studies have shown that ignoring the customer, having a "poor product", or offering "nice to have" products but not providing an essential value to the consumer, continue to be among the top reasons why start-ups fail (Jonikas, 2017; CBI insights, 2016). In the last decade or so, Industrial Design has transitioned from focusing principally on defining products

themselves, into defining and facilitating processes for innovation at a strategic level. This reframes Industrial Design as the investigative and realization process for innovation. *PepsiCo, Philips* and *Apple* have successfully incorporated design at their corporate strategic levels for several years (Stuhl, 2014). Former start-up in high tech areas such as *Pinterest, Kickstarter* and *Airbnb* have designers in their founders' teams, signifying the potential importance of elevating the role of design to a strategic level in this way.

Developments in General Entrepreneurship practice/theory

There are a number of contemporary theoretical and practice-based perspectives on entrepreneurship, which are pertinent to product development. They include: *Effectual logic* (Sarasvathy, 2001); *Bricolage* (Baker & Nelson, 2005); *The Lean Start-up* (Ries, 2011); *Design Thinking and Design Sprints* (Brown, 2008; Knapp, 2016); *Venture Design* (Frog Design, 2016); and *The Startup Owner´s Manual* (Blank and Dorf, 2012). These approaches vary from traditional business logic, being focused on the creation of new ventures and follow a model defined by Sarasvathy (2001) as *Causal Logic*. These perspectives are further described below.

Approaches derived from practice.

Several influential entrepreneurship models are derived from practice. Based on his experience of working with Silicon Valley start-ups, Eric Ries (2011) outlined the *Lean Startup* method, aiming to shorten the cycle of product development through experimentation and iterative processes. Knapp (2016) used *Design Thinking* (Brown, 2008) to shortcut the four steps process of the *Lean Startup* method composed of the idea, build, launch, and learn into just two stages: Idea and learn, to come up with *Design sprints*, to reduce the time cycle and risk when bringing new products to the market. Along the same lines, using its gained experience working with companies as a design agency around the world, *Frog Design* (USA) developed *Venture Design* (2016). This aims to shape the whole business opportunity through design-methods, it favours progress over perfection, and facilitates interdisciplinary working. Serial technology entrepreneur Steve Blank detailed a method based on a scientific approach to entrepreneurship, whereby repeated testing and accurate measurements can increase the success-rate of start-ups (Steve Blank, 2012).

Among these new approaches to entrepreneurship, *Bricolage* and *Effectuation* share a principle where the means dictate the end goals. All of

them are flexible when it comes to the future of the new venture. The experimental mind-set and creativity are fundamental to come up with different combinations. Both Bricolage and Effectuation discover the problem as they are building the solution, drawing a similarity with design-based approaches. Cross (2001) described this as; *designerly ways of knowing*, where design defines the problem as it is unveiling the solution.

Expert entrepreneurs, the ones that have attained reliable, superior performance start-up business, argue against taking predictions seriously, they instead work with things they can control, even if that means changing their initial goals and visions for the future (Dew et al. 2009).

Expert entrepreneurs also look forward to reducing the cost of failure by enabling the failure to occur earlier and at lower levels of investments. They believe in a *Yet-to-be-made* future (Gabrielsson, 2009). Entrepreneurs tend to find ways to reach the market with the minimum expenditure of resources in terms of time, effort and money (Sarasvathy, 2008).

Theoretical perspectives

Causation, Effectuation and Bricolage, the three theoretical perspectives previously mentioned were taken into consideration for the broad understanding of the problem, including their logic, principles and mind-sets, allowing for future descriptive analysis of the design entrepreneurship approach. The practical approaches such as *Lean start-up*, and *Design Sprints* were excluded from this analysis since their prescriptive nature of the approaches, focused on steps and tools. Design Ventures has been ruled out due to the limited information available about it.

Causal logic

Causal Logic is based mostly on economic thinking to describe the entrepreneurial action (Fisher, 2012). The Exploitation of pre-existing knowledge and prediction minimize risk (Sarasvathy, 2005). As part of the principles in this approach we find:

- Pre-set goals: it assembles the means after a goal is set.
- Expected return: it first targets a return, then works to minimize associated risk.
- Avoid contingencies: it works to minimize the probability of unexpected outcomes.
- Inevitable future mind-set: it accepts that established market forces will cause the future to unfold.

- Statistical analysis: Based on related previous quantitative evidences, prediction and forecasting takes control of the analysis.
- Competitive Analysis: it presumes that competitors are rivals to contend with (Sarasvathy, 2001).

Effectuation

On the other hand, Sarasvathy (2008) identified Effectual Logic when she conducted a study with expert entrepreneurs, finding that they make decisions based on what they have at hand. They see challenges as opportunities, they rely on their personal network, the end goal is not fixed and by focusing on the downside of the venture, they first consider what they are willing to lose rather than the possible gains. Sarasvathy (2008) summarises these principles as follows:

- Start with your given means

The entrepreneurs imagine possibilities that originate from their means. Who I am, what I know, and whom I know.

- Focus on the downside risk:

Affordable loss principle. Expert entrepreneurs limit risk by understanding what they can afford to lose at each step, instead of seeking large all-or-nothing opportunities.

- Leverage contingencies:

Instead of making "what-if" scenarios to deal with worst-case scenarios, experts interpret "bad" news and surprises as potential clues to create new markets.

- Form partnerships:

Experts reduce uncertainty and co-create the new market with its interested participants.

- Control over prediction:

By focusing on activities within their control, expert entrepreneurs know their actions will result in the desired outcomes. An effectual worldview is rooted in the belief that the future is neither found nor predicted, but rather made.

- Co-creation of the opportunity:

The self-selected stakeholders and the *entrepreneur* act together towards the same goal.

- Failure as a learning experience

Failure is seen as a source of knowledge rather than as a failure

Bricolage

Besides this theory, Baker and Nelson (2005) discovered that some entrepreneurs started their businesses by making do and applying combinations of the resources at hand to solve new problems and create new opportunities, this theory was called Bricolage (BR). According to Levi Straus (1967) Bricolage has got a tendency towards action and active engagement with problems rather than analysing and predicting possible outcomes from what is at hand. The principles under this logic are (Baker and Nelson, 2005):

- Combinational process:

Looking for new combinations of available means for different applications than those for which they were originally intended or used.

- Scarcity:

Lack of resources (time, funding, knowledge) focalizes creativity.

- Making do:

Find results with a hands-on attitude using the limited skills and resources in creative ways.

On the other side: The design perspective

The modern practice of design has evolved from an object-centred process that solves one problem, to a cross-disciplinary approach that engages deeply with the human, innovates organizations through systematic processes, creates community, understands the values, market and social phenomena, and builds a common language between the disciplines involved in the process to provide novel approaches and solutions (Archer, 1981; Cross, 1999, Max-Neef, 2004).

The design discipline has multiple perspectives and different objectives. For this research two main approaches have been selected, due to their compatibility to create new consumer products: Strategic Design and Design Thinking.

Strategic Design

Strategic design uses the principles, tools and methods from the design discipline to influence strategic decision-making within an organization (Calabretta, 2017). It provides a way to use design to build key business objectives (Lockwood and Walton, 2008) such as:

- Purchase influence/emotion:

Design provides guidance in the configuration of the products to boost emotions and lure the customers´ purchase.

- Build brand image and corporate reputation:

Design supports the company to show its capabilities to all the stakeholders. The configuration of the solution, and the company´s touchpoints determines how the brand is perceived by the customer and the stakeholders.

- Enable strategy/enter new markets:

Design helps visualize the business strategy and engages stakeholders by sharing the same vision, to enter new markets, design the focus of the product, its communication, interfaces and experiences, to let users understand its purpose.

- Increase customer satisfaction, and develop communities of customers:

The inclusive process of design involves customers from a very early stage by asking for their feedback. This interaction guides the designer to a more effective solution.

Design Thinking

Design Thinking is generally defined as an analytic and creative process that engages a person in opportunities to experiment, create and prototype models, gather feedback, and redesign using visual, empathetic and experimental tools (Brown, 2004; Shute, 2012). It focuses on designing effective solutions to meet social needs and solve complex problems (Rotherham & Willingham, 2009) through an empathic understanding of the problem to solve it (Dam & Siang, 2017). According to Owen (2016) Design Thinking is based on the following principles:

- Visual language:

Utilizing a wide range of tools, designers can communicate concepts, ideas, stories and how they are connected to the big picture.

- Bias for adaptivity

The flexible mind-set of designers allows them to be open to accepting new ideas.

- Systemic Vision:

A holistic understanding is needed to tackle more complex problems.

- Qualitative mind-set:

People´s insights are gathered through qualitative methods, focusing on the depth of the information.

- Cultural fitness:

The ethnographic research tools of design draw the connection between the subject, the objects and its context. Cultural fitness is achieved by considering the characteristics of the solution and how they interact between people and its context.

- Aesthetic acumen:

Designers have skills and processes that enhance the aesthetic experience, through paying attention to details and considering trends and social changes.

- Human-Centred focus:

The process of design begins with the people being designed for and ends with solutions tailored to meet their needs (Design Council, 2015).

Currently, design practices are far from linear methodologies. The complexity of the current social phenomena requires a holistic approach. Howard et al. (2008) compared the industrial design process throughout the last 50 years. He identified six different phases among all of them: Establishing needs, analysis of task, conceptual design, embodiment design, detailed design and implementation. It should be noted that these steps are embedded within a corporate system, where the designer is integrated to a more significant chain of actions. A recent view of the design process involves interaction with multiple disciplines. We can see that design is an innovation

process that can leverage the performance of entire organizations (Kumar, 2009).

Design entrepreneurship is linked to innovation

Between industrial design and product innovation, there is a leap. This leap is when the team goes beyond the prototype and turns itself into a company that can bring the product to the market. The entrepreneurial activity covers the set of actions, mind-sets and processes that enable the product to reach the market.

Designers of consumer end products need a practical way to start up a business. A way in which they are able to get closer to a tangible solution faster, which is marketable and that the customers are willing to pay for. Bricolage and effectuation, instead of asking for detailed analysis, focus on a set of principles aimed at always making progress. What is available determines the outcome, and the scarcity of the environment focuses the creativity.

Business schools have traditionally focused on analytical tools and methods to bridge the distance between an initial idea and getting to market. But analysis usually relies on understanding what has gone before, and when a new path doesn't easily relate to previous experience, as in the case of innovation in new markets and technologies, there is no reliable trend to project.

New products in new markets

Petersen (2016) broadened the understanding of the Ansoff matrix (Ansoff, 1957) expanding the understanding of disruptive technologies and markets and how they deal with risk and uncertainty. In a similar way, Frog Design, through its spin-off for start-ups called Venture Design, expanded the Ansoff Matrix (Frog Design, 2017). It helps to visualise the possible growth areas in an organisation, whether they are start-ups, spinoffs or established companies.

Ansoff Matrix Expanded

Fig.1. Ansoff matrix expanded (Frog design, 2017).

As we can see in the bottom left quadrant, companies located in traditional markets and traditional processes are looking to penetrate the market. Stakeholders know what to expect from their offerings and the acquisition cost is not high since the awareness of the product is there. Previous products and competitors have been around with a similar offering. Causal logic works appropriately under this condition since its tools rely on a numerical foundation to recognize the opportunity, that is, the opportunity

exists independent of the actions of the entrepreneur, just waiting to be detected and exploited (Sarasvathy, 2008; Alvarez and Barney, 2007; Shane and Venkataraman, 2000). It focuses on what needs to be done to achieve the established goals with all possible means. It is objectively driven.

One of the biases within this doctrine is a reliance on forecasting and prediction. The goal is set at the beginning, and the entrepreneur has to find the way to make that objective happen. The challenge is when there is little available information on which to base the predictions, so the projection of the future is not reliable. The exploration of new-to-the-world product concepts and the targeting of newly created markets (top right quadrant) is different. Sometimes called Blue Ocean Strategy (Kim and Mauborgne, 2004) it demands an experimental mind-set, since the primary objective is not to improve an existing offering but to define entirely new value propositions. This type of entrepreneurial activity operates in a climate of uncertainty, where companies or start-ups don't know what they don't know. There are often numerous unknowns including the size of the market, customer acquisition costs, reliability of the product, market share, product lifecycle, technological readiness and the product's functional and aesthetical attributes. Taken along with unexpected events affecting the context for such new-to-the-world concepts, the complexity precludes a scientific approach to prediction.

There is uncertainty in new markets and in new products

The terms Risk and Uncertainty are commonly used interchangeably not only in everyday life but in academia and in business settings, creating imprecision and confusion. We can define risk as the objective forecast and estimation of the consequences of not achieving an expected outcome, whereas uncertainty, is defined as *unquantifiable* ambiguity, based not only on randomness but also on beliefs and behaviours (Rutherford, 2002; Regan, 2011).

Uncertainty is a condition of insufficient knowledge or insufficiently reliable information. This condition arises when there is no previously documented understanding of similar phenomena. Facing problems under uncertainty requires an open mind-set that allows entrepreneurs to process the information creatively, connecting this information in novel ways to discover and create a unique understanding of the phenomena.

Risk assessment is possible when there is information available of similar previous examples, allowing entrepreneurs to have predictions based on quantifiable figures. Whereas, innovation in new markets and/or in new

products has such a high level of uncertainty that risk assessment is impossible (Carayannis, 2013). For Ries (2016), due to the fact that there are no available reliable data to estimate possible outcomes. The concept of entrepreneurship includes anyone who works within the definition of a start-up: a human institution designed to create new products and services under conditions of extreme uncertainty.

Cross (2011) described how designers have learned that design proposals may remain ambiguous and uncertain until quite late in the process, saying that as the solution is built, the understanding of the problem gets clearer.

An explorative mind-set also supports the idea of an inductive approach, resolving and adapting the process as the solution is evolving. The flexible process also allows for increasing the opportunity to reach innovative solutions.

Conclusion

In some high-profile success stories, the role of Design as a strategic driver in business is being increasingly recognised and discussed. Many major business management consultancies have acquired design agencies (Hurst, 2013), and the US's top ten Business Schools all have Design Clubs, led by students, in recognition of Design as a method-set or tool-set for business innovation (Maeda, 2016). However, much of the data on how this phenomenon translates into the design role in entrepreneurial start-ups remains on a case-by-case basis, making generalisation of principles and approaches difficult. This is compounded by overlapping definitions of entrepreneurship, seen from several different disciplinary perspectives. Through the discussion section, this paper has begun to identify common themes in this mixed literature and to clarify distinctive mind-sets. Although it remains a work-in-progress, these mind-sets have been discerned and modelled as a conclusion to this paper into a preliminary framework (fig. 2). The model attempts to separate the distinctive elements of design approaches from three key theories of general (non-design-led) entrepreneurship. The value of this framework will be to interrogate real cases of design entrepreneurship to understand the changing role of design in this context.

Integrative preliminary framework

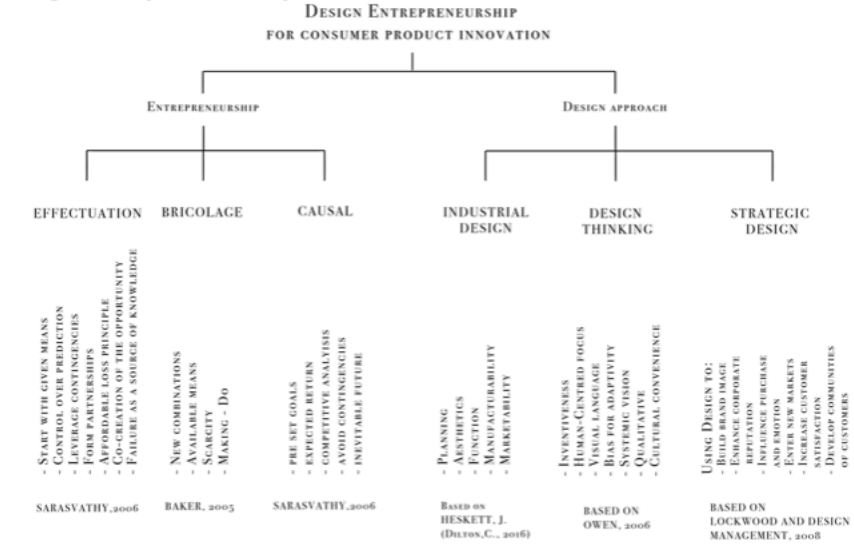

Figure 2. Design Entrepreneurship for consumer product innovation and Integrative Preliminary Framework

This framework is the basis to decode the actions taken by designer-entrepreneurs while they are starting up their consumer product business. Therefore, the value of this framework is taxonometric, to analyse the decisions made from the idea to the validation of the product. Its utility is to assist the correlation and integration of theory and practice, leading to improved understanding and articulation of potential paths to successful entrepreneurship.

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Annex H – RESEARCHER´S CURRICULUM VITAE

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Research Interest:

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I am passionate about the use of design as strategic leverage to enable product and service innovation, increase customer satisfaction, build brand image and influence purchase and customer emotions. Also, I am interested in the use of design to build an organizational culture where talent (highly creative individuals) can thrive.

Profile

- I ran a multidisciplinary masters program in design and innovation for four years, which gave me a more rounded perspective on the administrative tasks and research activities behind education.
- I have developed modules for undergraduate and postgraduate design programs.
- I worked for three years as a facilitator in a business incubator in the area of Strategic Design.
- I have published academic papers, book chapters and magazine articles in the field of Design Management, Design Innovation and Entrepreneurship.
- I have eight years of experience in education as a lecturer for undergraduate programs and five years of experience delivering lectures as part of a postgraduate program.
- I have taught for one and a half years at Northumbria University at a postgraduate level.

Education

PhD. Student - third year. Submission date: December 2019 — **2016 - On going**
Northumbria University, School of Design, Newcastle, United Kingdom.
Research Area: Designer-Entrepreneurs in Consumer Product Start-ups.
Currently researching the transition from being a designer to becoming a designer entrepreneur.

Exchange student — **2017**
North-Western Polytechnic University. Xi an, Shaanxi Province, China.
Use of Design thinking tools to develop a wire-frame of a platform aimed to connect Chinese and British students.

Master in Innovation and Design — **2010 - 2012**
Engineering Faculty, Autonomous University of Queretaro, Mexico.
Graduated with honours. Specialization: Strategic Design

Exchange student — **2006**
Engineering core, Concordia University, Montreal, Canada.

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Master s program: Design Management, Northumbria University, School of Design, Newcastle, U.K. Modules: Strategic Design; Project-Thesis.
Planned and taught the courses based upon current methods of innovation.
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Secondment #2: **2018**
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Host Institution: Dublin Institute of Technology, Dublin, Ireland.

Secondment #3: **2019**
Host Company: Megagen Implant, Daegu, South Korea.
Host Institution: Chonnam National University, Gwangju, South Korea.

Lecturer **2012 - 2016**

Autonomous University of Queretaro, Design School.
Subjects: Strategic Design, Human Centered Design, Thesis Seminar and Mathematics for Design. Planned lessons and assignments, led discussion sections, graded papers and exams. Organized and led the Seminar "Innovation and Interdisciplinary issues".
Trained in teaching strategies, competencies and class planning.

Design led innovation consultant - business incubator **2013 - 2015**

INCUBAUAQ, Queretaro, Mexico.
Facilitated workshops to the companies; Developed innovation strategies based on human-centred design. Close collaboration with a major Innovation Consultancy in Mexico City called Trecho Innovacion.

Masters program director **2012 - 2015**

Master's Degree Program in Design and Innovation. Autonomous University of Queretaro. (Program Subscribed to the Excellence Programs of the National Science and Technology Council in Mexico – CONACYT). Planned and led required academic work; Collaborated and coordinated with faculty, staff, and students to accomplish the program's goals; Administrative work. Led the restructuring of the program.

Lecturer **2016**

Universidad del Valle de Mexico, School of Management. Queretaro, Mexico.
Planned lessons and assignments, led discussion sections, graded papers and exams.

Technical Manager at Grupo IPC. **2009 -2010**

Management of the team in charge to design and develop industrial measuring systems.

Industrial Engineer at Mabe - Home Appliances. **2008**

Area: Lean Manufacturing.

Academic Highlights

International award **2018**
Student Essay Competition winner 2018.
Essay title: “Insights about the way designer entrepreneurs manage start-ups”.
Design Management Institute, Boston, United States.

Scholarship granted **2014**
Proyecta 100,000 by the Mexican Ministry of Foreign Relations.
Northern Colorado University, Colorado, United States.

Other Certifications

Business Booster Training, **2019**
Applied Social Sciences for Business Innovation, Skillfluence, NINE DTP, York, UK.

Accredited Facilitator **2013**
“Entrepreneurship”, Ministry of Economy, Mexico.

Training Certificate **2012**
“Innovators Program”, The Cambridge University – CIATEQ – CIDESI – CIDETEQ.

Training Certificate **2012**
“Technology Transfer Training - ISIS Innovation” University of Oxford / CONACYT.

Strategic Management **2011**
Universidad de la Habana, Cuba.

Biomechanics. **2011**
Universidad de Fajardo, Cuba.

Directed theses

4 undergraduate theses - In Industrial Design, A. University of Queretaro, Mexico.
4 master degree theses - In Strategic Design, A. University of Queretaro, Mexico.
4 master degree theses – In Design Management, Northumbria University, U.K.

Book Chapters

First Author

- “***Research Theory in Strategic Design***”, 2016. **2016**
Book: Innovation in strategic design, methodological structure and application of case studies, 2016, ISBN 978-607-32-3865-6, Publisher: Pearson. In Spanish.

- "***Fundamentals of the Strategic Design process***", 2016 **2016**
Book: Innovation in strategic design, methodological structure and application of case studies, 2016, ISBN 978-607-32-3865-6, Editorial Pearson. In Spanish.

- “***Between the design and entrepreneurship there is logic***”, 2016 **2016**
Book: Transdiscipline in Art and Design, 2016, ISBN 978 607 441 448 6,
Publisher University state of Guanajuato, Mexico. In Spanish.
https://issuu.com/ricolopezleon/docs/transdisciplina_y_dise__o

Co-author

- “***Academic Centre for Design and Product Innovation: Start-up of intellectual property policies***”,2016, **2016**
Book: Knowledge and technology transfer in Mexico and Germany: experiences from the GeT- In. ISBN 9786074824803. Publisher: UAEH. In Spanish.

- “***Design of breast cancer prevention model***”, 2016, **2016**
Book: Innovation in strategic design, methodological structure and application of case studies, 2016, ISBN 978-607-32-3865-6, Publisher: Pearson. In Spanish.

Papers in proceedings of international conferences

"***Existing in the wild: Designer entrepreneurs moving from invention to innovation via an advantage seeking mindset***", International Conference - Global Entrepreneurial Talent Management and Social Collaboration, Gwangju, South Korea. *In English.* **2019**

"***Exploring the role of design-as-strategy in consumer product start-ups***", dmi: Academic Design Manage- ment Conference, London, U.K. *In English.* **2018**

"***The Effectiveness of Environmental Design for Physical Activities Promotion***", 12th European Academy of Design Conference, Roma, Italia. *In English.* **2017**

Papers

First Author

"***Notes on Designer entrepreneurs and the Gepetto Effect***", 2019, Design Management Institute, dmi:Review, Vol. 30 issue 2, pp.16- 2. *In English.* **2019**

"***The culture of Innovation in higher education institutions in Mexico***", 2015, Ciencia@UAQ. Latin Index. In Spanish. **2015**

"***Strategic design as a catalyst for innovation and success in Latin America***", 2012, Cien- cia@UAQ. Latin Index. In Spanish. **2012**

Co-author

"***The Effectiveness of Environmental Design for Physical Activities Promotion: Review***", 2017, Gonzales-Moreno, A., Valencia-Hernandez, J.A., Valencia-Hernandez, J.O., The Design Journal. *In English.* **2017**

Previous Projects

- Setting up the Academic Centre for Innovation and Product development, Queretaro State University, Mexico.Member of the unit in charge of developing the policies of technology transfer and mechanisms to collaborate with the regional industry. **2015**

- App Development, in charge of the wireframe and integration of the information. Sustainable Architecture Client: KALTIA, Mexico. **2015**

- Design project: Fugitive structures: Trailer of science, Client: CONCYTEQ, Mex. Design and development of an itinerant museum to bring education in technology and innovation to rural areas in Mexico. **2013**

Development of an Integral model for social development through community cultural tourism, Mexico. **2013**
Leader of the multidisciplinary team in charge of designing furniture and signage.

Development of a Mobile intercom system based on convergent technologies for applications in health, education and agroindustry, Mexico. **2013**
Design and prototype of a mobile phone capable bring satellite internet to rural areas in Mexico.

Patent applications- pending

"***Pedal device for physical activity while sitting for desks at the workplace***" Registered in 1/Dec/2015.Folio MX/E/2015/087918. **2015**

"***Cactus (nopal) pruning machine***" **2015**
Registered in 1/Dec/2015. Folio MX/E/2015/087922.

Website

https://getm3.eu/aldo-valencia/


European Commission
Brussels, 02/08/2019
Certificate of Award
Jose Aldo Valencia Hernandez
was awarded in 2017 a
MARIE SKŁODOWSKA-CURIE Fellowship
as part of the EU-funded project
GLOBAL ENTREPRENEURIAL TALENT MANAGEMENT 3
(GETM3)

西北工業大學
NORTHWESTERN POLYTECHNICAL UNIVERSITY
中国·西安
Xi'an, 710072
Shaanxi Province
P.R. China

CERTIFICATION

To whom it may concern,

The purpose of this letter is to certify that student Jose Aldo VALENCIA HERNANDEZ has been an exchange student starting from September 14, 2017 to September 24, 2017 in school of mechanical engineering of Northwestern Polytechnical University. During this period, Jose Aldo VALENCIA HERNANDEZ has worked for an industrial design project and has been a valuable member of the group. It is expected that he will continue to have a productive career.

School of Mechanical Engineering,

Northwestern Polytechnical University

26/09/2017

Newcastle University
Business School

Newcastle University
Business School
5 Barrack Road,
Newcastle Upon Tyne,
NE1 4SE, United Kingdom

25th September 2019

Re: Formal Invitation to Give a Research Seminar

Dear Jose Aldo Valencia Hernandez,

Newcastle University formally invites you to give a seminar to the Innovation, Enterprise and Digital Business Research Community.

The details of the seminar are:

Date: Wednesday 16th October, 12.30 pm

Speaker: Jose Aldo Valencia Hernandez (Northumbria University)

Topic: Design entrepreneurship and innovation through Design

If you have any queries about this invitation, I can be contacted on +44 191 2081576 or matthew.gorton@newcastle.ac.uk.

Yours faithfully,

Matthew Gorton,

Professor

Annex J – PARTICIPANTS PHASE ONE

Academics

AC-1 – Senior Lecturer in Entrepreneurship, Greenwich University, UK.

AC-2 – Lecturer, Mentor, Visiting Professor, Berkley U.C, USA

AC-3 – Professor in Entrepreneurship, Northumbria University, UK.

AC-4 – Author, Professor, Researcher in Design Driven Innovation, Milan Polytechnic, Italy.

AC-5 – Researcher in Entrepreneurship, Denmark Technical University, Denmark.

AC-6 – Researcher, Mentor in Entrepreneurship in Hardware, Central Research Laboratory, Brunel University, UK.

AC-7 – Author, Professor in Strategic Design, TU Delft, Netherlands.

AC-8 – Professor in Design and Innovation, Amsterdam University of Applied Sciences, Netherlands.

AC-9 – Professor in Entrepreneurship, Dublin City University, Ireland

AC-10 – Couch and professor, Open University, London.

Investors

I-1 – Investor and CEO of the first found for product design start-ups in Europe, London, UK.

I-2 – Investor and CEO of a multimillion-pound Design and Manufacturing business, London, UK.

I-3 – Investor, Author and Entrepreneur in hardware, software and artificial intelligence, London, UK

I-4 – Investor in Additive Manufacturing and Clean transportation, Newcastle, UK.

Business Incubator and Accelerators

BIA-1 – Head of the incubation program for product designers, branch of one of the most influential Design Organizations in the UK.

BIA-2 – Head of the incubation program at a local business incubator and accelerator in the North East, Newcastle, England.

BIA-3 – Business coach at the world's most active early stage investor, incubator and accelerator in hardware, Shenzhen, China.

BIA-4 – Director of the Business incubator of a Business incubator in Ljubljana, Slovenia.

BIA-5 – Business Developer of a worldwide manufacturer advisor, Boston, USA.

Platforms and Events

PE-6 – International director of Design at a crowdfunding platform with presence in more than 200 countries.

Non - Designer Entrepreneurs

NDE-1 – Footwear Entrepreneur - Marketing background, London, UK.

NDE-2 – High-tech entrepreneur hardware - Mechanical engineer background, London, UK.

NDE-3 – Serial Entrepreneur – Software engineer background, Mexico

NDE-4 – Entrepreneur in consumer products - Mathematics background, UK and China.

Designer Entrepreneurs

DE-1 – CEO of a product based (Kitchenware) company, former entrepreneur. More than 20yrs of experience as a business owner.

DE-2 – CEO of a medical device company, 3yrs trading at the moment of the interview, Germany.

DE-3 – CEO of a baby product company, 2yrs trading at the moment of the interview, Bristol, UK

DE-4 – CEO of an *IoT* product design company, 7yrs trading at the moment of the interview, London, UK.

DE-5 – CEO of a design studio and product company, 1 year trading the product, London, UK.

DE-6 – CEO of a design studio and product company, on trials and proof of concept at the moment of the interview, Newcastle, UK.